

007.5507
015.069.8
012.911.



KUP 10 307 Z
KUP 10 317 Z
KUP 10 318 Z
KUP 10 308 Z
KUP 10 309 Z
KUP 10 337 Z

BESTELL-NR.	0075507
GERAETEBEZEICHNUNG	UNIV.-STEREO-TURN
WARENGATTUNG	659
AUSFUEHRUNGS-NR.	001
GERAETEBESCHREIBUNG	GTX-1001
PRIVILEG	VTCF 118
LIEFERANTEN-NR.	442419
PREIS	999.00
KATALOG	914
GARANTIEZEIT	6
KD-SEKTOR	R
HEIM/BRINGE	WERKSTATT
BETREUUNG	EIGEN
KOSTENTRAEGER	EIGEN

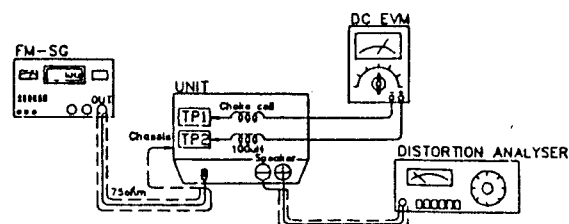
FM MONO DISTORTION ADJUSTMENT

1. Test equipment connection is shown in figure.
2. Set the unit to "FM" position.
3. Place the radio frequency display and signal generator setting to 100.10MHz.
4. Adjust T106 core so that voltage measured in signal mode is 0mV ($0 \pm 30\text{mV}$) in range.
5. Adjust T107 so that the distortion factor of Lch is minimized.
6. Repeat steps 4 and 5 a few times.
7. Make sure that the distortion factors of Lch and Rch nearly the same with each other to minimum.

Note: The adjusting screwdriver used should be made of ceramic.

FM SIGNAL GENERATOR CONDITION

Modulation 100%
 Modulation frequency 400Hz
 Output level 66dB



MPX VCO ADJUSTMENT

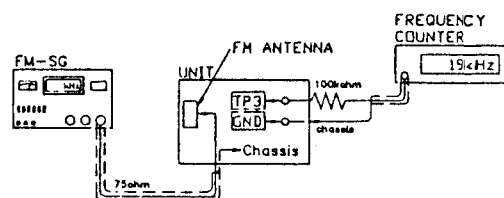
1. Test equipment connection is shown in figure.
2. Place the radio frequency display and signal generator setting to 100.10MHz.
3. Adjust VR11 for 76kHz $\pm 0.05\text{kHz}$ on frequency counter reading.
4. Modulate the pilot by 8% and make sure that the stereo indicator lights up.

USING ALTERNATE SYSTEM

1. Apply stereo signal from generator or receive the stereo broadcast.
2. Adjust VR11 until stereo lights up.

FM SIGNAL GENERATOR CONDITION

Modulation 0% (non - modulation)
 Output level 66dB



CASSETTE

MEASUREMENT CONDITION:

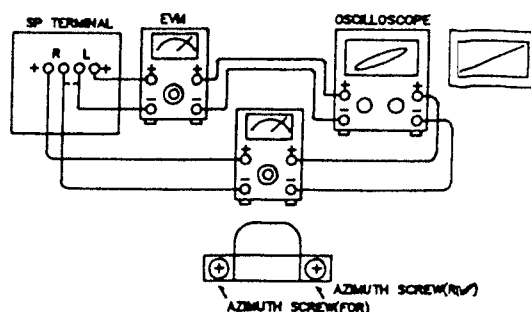
- Make sure heads are clean.
- Make sure capstan and pressure roller are clean.

TEST TAPE:

- Head azimuth adjustment (10kHz, -10dB): MTT-114N.
- Tape speed adjustment (3kHz, -10dB): MTT-111N.
- Normal reference blank: MTT-5511.

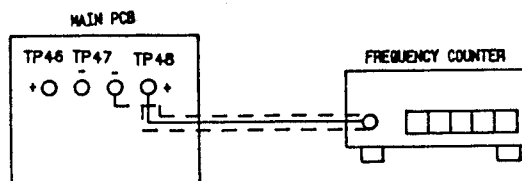
HEAD AZIMUTH ADJUSTMENT (Tape1, 2)

1. Test equipment connection is shown in figure.
2. Playback the azimuth adjusted part (10kHz, -10dB) of the test tape (MTT-114N) and regulate the angle adjusting screw so that the outputs of L-CH and R-CH are maximized.
 (When the adjusting positions are different with L-CH and R-CH, find a position where the outputs of L-CH and R-CH are balanced, and then mark the adjustment.)
3. At the same time, draw a lissajous waveform and eliminate phase deflection.
4. After the adjustment, apply screw-lock to the angle adjusting value.



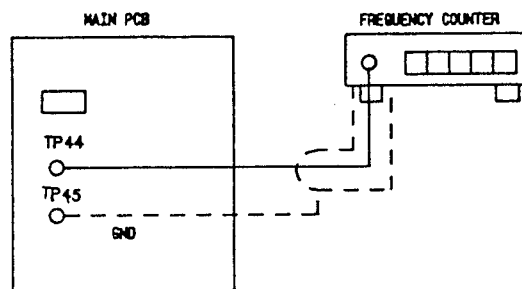
TAPE SPEED ADJUSTMENT (Tape 1, 2)

1. Test equipment connection is shown in figure.
2. Place unit into "TAPE" position.
3. Playback the middle part of the test tape MTT-111N.
4. Adjust first VR43 for high speed ($6000 \pm 60\text{Hz}$) and then VR44 for normal speed ($3000 \pm 30\text{Hz}$)



BIAS OSCILLATION ADJUSTMENT (DECK 2)

1. Test equipment connection is shown in figure.
2. Insert a metal tape and set the cassette deck to REC mode.
3. Adjust L407 for 105kHz on frequency counter reading.



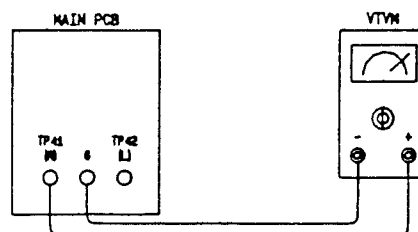
RECORDING BIAS ADJUSTMENT

1. Test equipment connection is shown in figure.
2. Place unit into "TAPE" position.
3. Insert a metal tape and set the cassette Deck to REC.
4. Adjust VR41("L" CH), VR42("R" CH) for suitable recording bias.

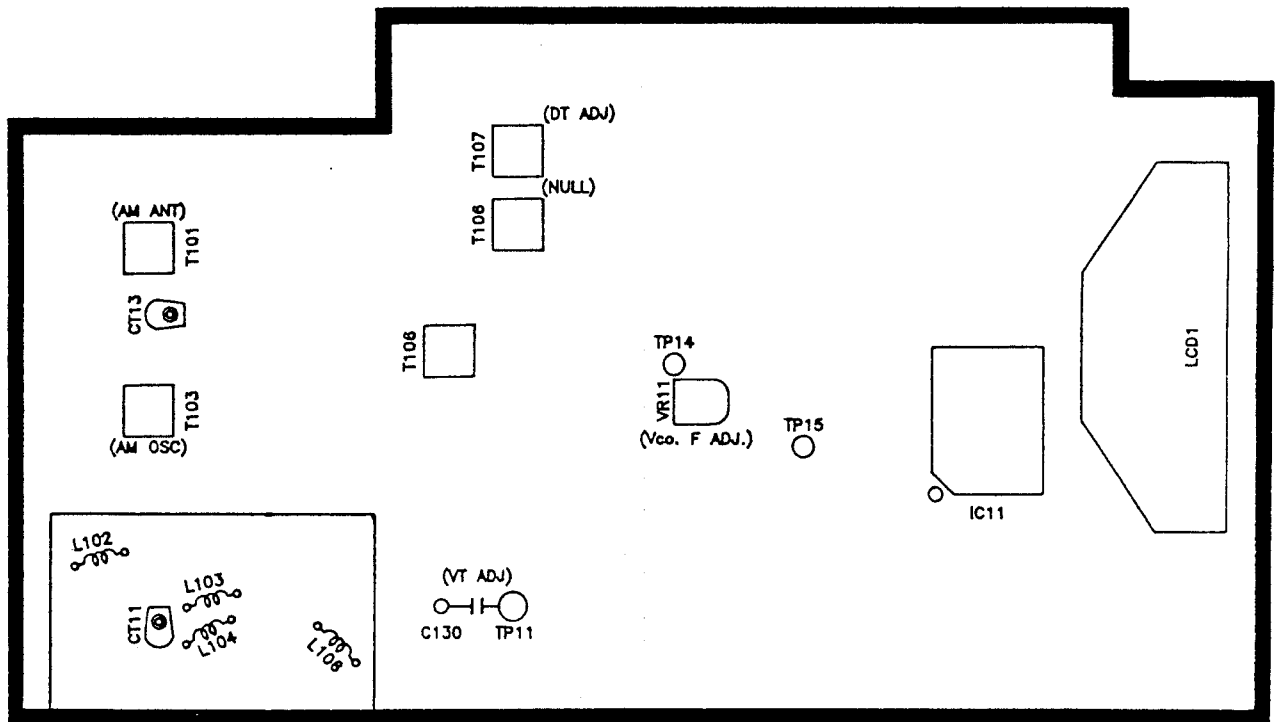
(STANDARD REC BIAS is METAL = $1000\mu\text{A}$)

CrO₂ = $650\mu\text{A}$

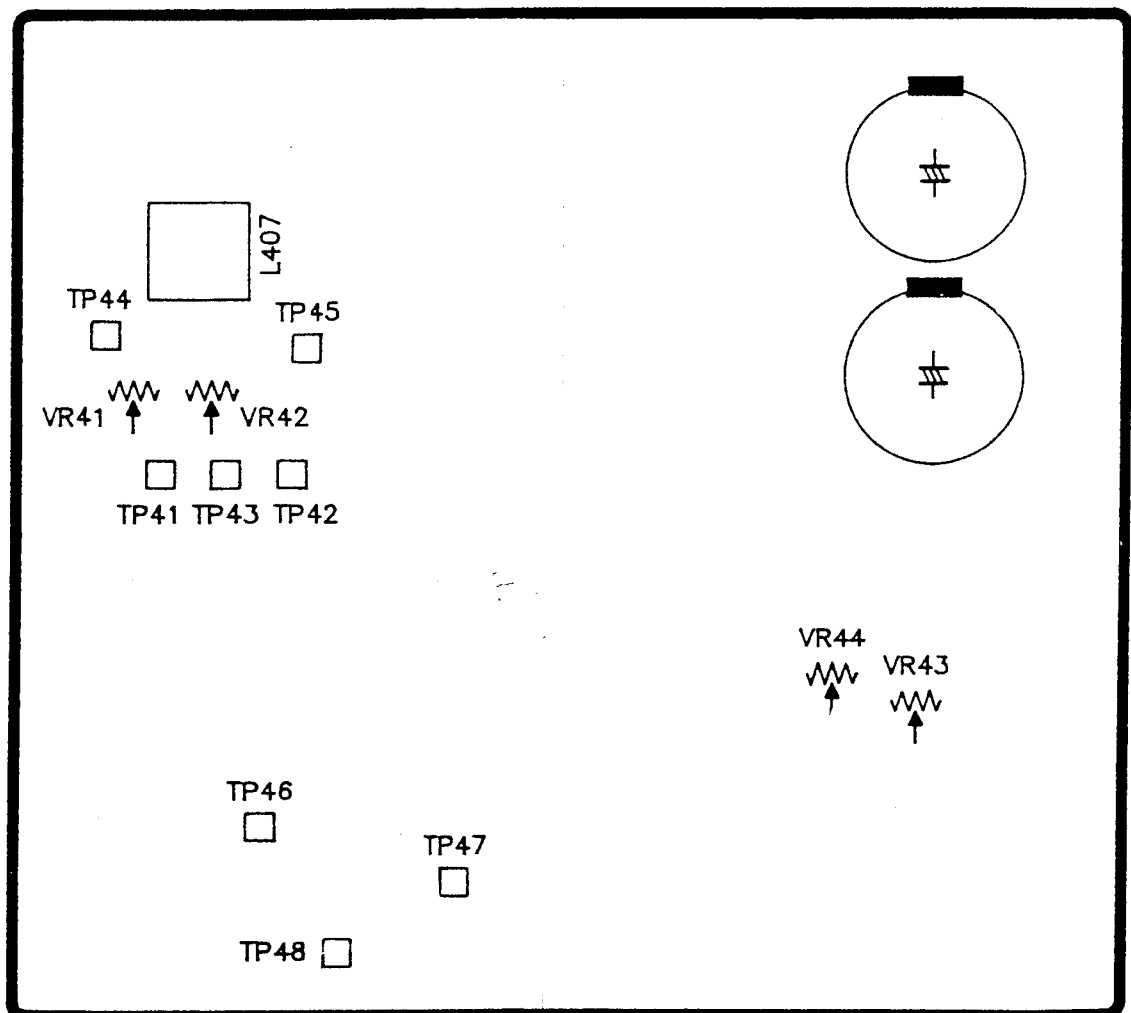
NOR = $420\mu\text{A}$



TEST POINT TUNER PCB



TEST POINT MAIN PCB



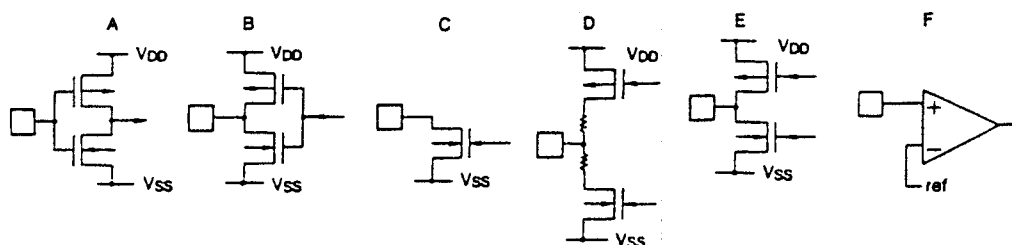
IC PIN FUNTIONS (PLL CONTROLLER IC 11: ANAM1013M)

Pin description

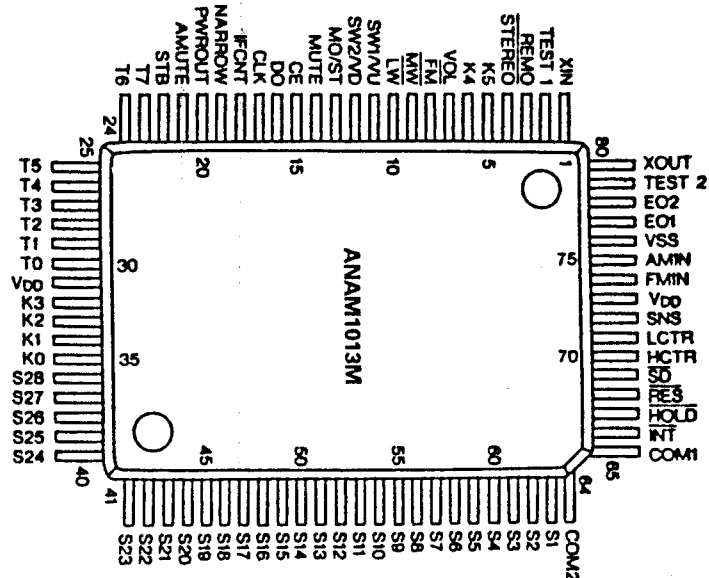
Pin Name	Pin No.	Description	Active	I/O	I/O Configuration
XIN	1	4.5MHz crystal oscillation pins	-	I	-
XOUT	80				
TEST1	2	Must be connected to Vss	-	O	-
TEST2	79				
REMO	3	Remote control signal input pin. Used with INT pin. When no remote control is not in use, pulled up to VDD through a resistor.	L	I	A
STEREO	4	When the stereo signal is brought Lo "L" level, "ST" LCD indicator light goes ON.	L	I	A
VOL	7	electronic volume control level display. pin	-	O	C
FM	8	Used to select the power supply for each band.	L	O	C
MW	9				
LW	10				
SW1/VU	11	Spec with "H" output only when VUP key is pushed	H	O	B
SW2/VD	12	no SW band "H" output only when VDN key is pushed			
MO/ST	13	Output pin for monaural "H"/stereo "L" selection	H	O	B
MUTE	14	"L" level at power ON mode. Each time you push MUTE key at the power ON mode, "H"/"L" toggle operation is carried out	H	O	B
CE	15	Serial data line of the LC7821	H	O	B
DO	16				
CLK	17				
IF CNT	18	N.C			
NARROW	19	N.C			
PWR OUT	20	Power control pin	H	O	B
A MUTE	21	Audio muting pin	H	O	B
STB	22	N.C	H	O	B
T7	23	Key scan output signal	H	O	B
T6	24				
T5	25				
T4	26				
T3	27				
T2	28				
T1	29				
T0	30				
K3	32	Key in signal	H	I	C
K2	33				
K1	34				
K0	35				
k4	6	Diode matrix input signal	H	I	C
k5	5				
S1 to S28	63 to 36	LCD segment driver pins	-	O	B
COM1 COM2	65 64	LCD common driver pins	-	O	D
HOLD	67	When brought to "L" level, the backup mode is entered. A chattering of approximately 20ms is eliminated.	L	I	A
SD	69	Signal to inform that a channel is received during auto tuning	L	I	B

Pin Name	Pin No.	Description	Active	I/O	I/O Configuration
HCTR	70	FM IF signal input pin	-	I	A
LCTR	71	AM IF signal input pin	-	I	A
SNS	72	When brought to "H" level, data is sent to the LC7821, chattering of approximately 20ms is eliminated.	H	I	A
FM IN	74	Local OSC input from FM VCO	-	I	A
AM IN	75	Local OSC input from AM VCO	-	I	A
EO1,2	76 77	Phase comparator output signal	-	O	E
$\overline{\text{INT}}$	66	Remote control signal input pin. Used with REMO pin	-	I	A
VDD	31 73	Power supply pin. Connected to +5V	-	-	-
VSS	76	Power supply pin. Connected to GND	-	-	-
$\overline{\text{RES}}$	68	Must be connected to VDD	-	-	-

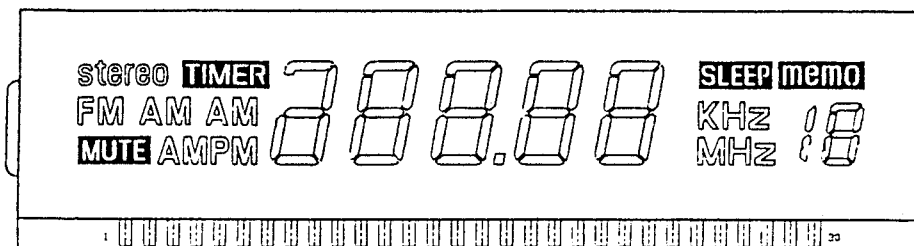
PIN INPUT/OUTPUT CONFIGURATION



IC PIN ASSIGNMENT



DESCRIPTION OF LCD PANEL

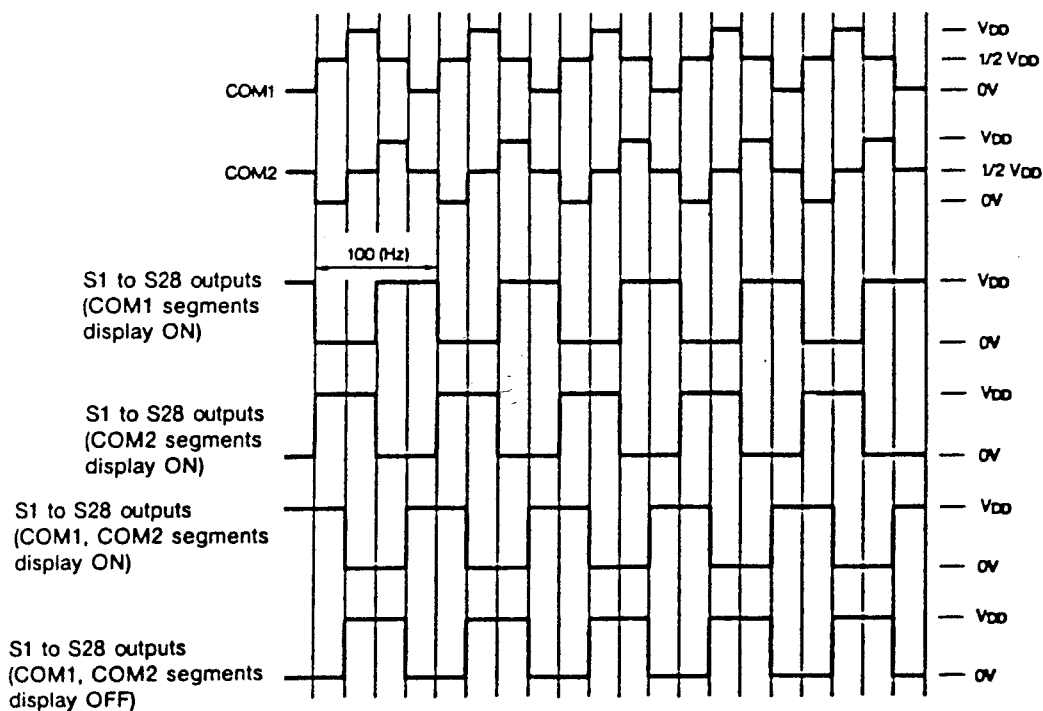


NOTE

1. C-WCS ANAM1013M
2. 1/2 DUTY, 1/2 BIAS.
3. 5.0 VCP.
4. VIEWING DIRECTION: 12-00
5. OPERATING TEMP. -10°C TO +80°C
6. STORAGE TEMP. -30°C TO +80°C
7. APPLICATION: HI-FI AUDIO.
8. NEGATIVE TYPE
9. BACK GROUND COLOR: GREEN.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
COM1		AM1			PM	MEMO	MUTE	31	01	F2	E2	D2	A2	F3
	COM2	FM	AM2	AM3	stereo			A.D.E.G.H	00	32	02	02		33
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
E3	D3	A3	F4	E4	D4	A4	G5	3E5	<-z	TIMER	F5	E6	D6	A6
G3	C3		B4	G4	C4		A.C.D.F.5		Hz P	1	36	G6	C6	SLEEP

WAVEFORMS ON SEGMENTS, COMMON PINS



MEASUREMENTS AND ADJUSTMENTS FOR CDP PARTS

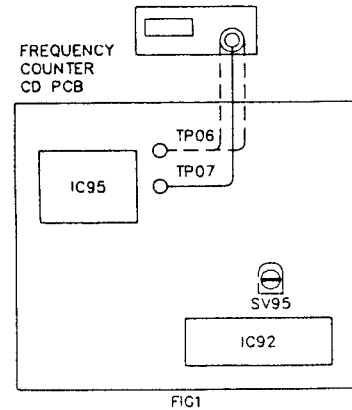
Control positions and equipment used

- Distortion analyser
 - Oscilloscope
 - Resistor
 - Disc YEDS - 18
 - 5.5A
- 10K ohm
SONY
PHILIPS

* after adjust, setting to center position.

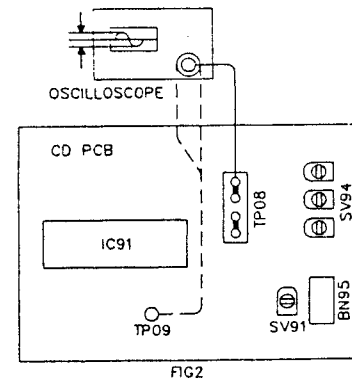
PLL ADJUSTMENT

1. Test equipment connection is shown in figure (Fig 1)
2. Set the ground position at the pin (Condenser C910 Short)
3. Adjust VR95 for 4.322 MHz on frequency counter reading (at stop)



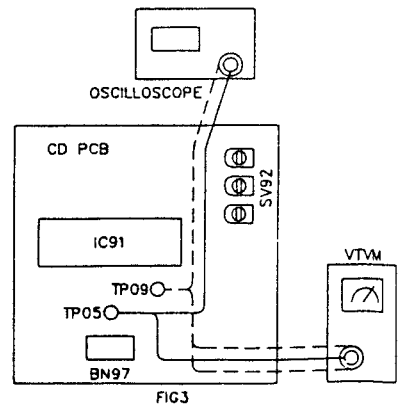
E.F. BALANCE ADJUSTMENT

1. Test equipment connection is shown in figure (Fig 2)
2. Play the band 5 of test disc
3. Turn to Left SV94 Max.
4. Adjust SV91 so that center of TE Signal displayed on the oscilloscope at the pin IC91 shall be 0 level



BEST EYE ADJUSTMENT

1. Test equipment connection in shown in figure (Fig 3)
2. Play the band 5 of test disc
3. Adjust SV92 so that the eye pattern of RF Signal is widest open.



FOCUS GAIN ADJUSTMENT

1. Test equipment connection is shown in figure (Fig 4)
2. Play the band 5 of test disc.
3. Adjust SV93 until monitor level at VTVM becomes $310\text{mV} \pm 10\text{mV}$

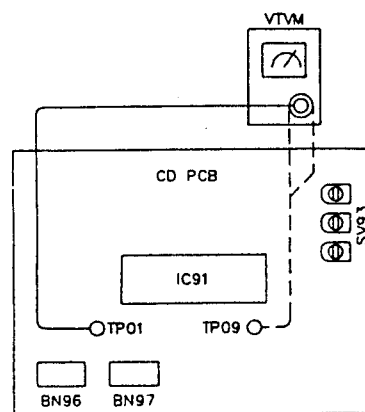


FIG4

TRACKING GAIN ADJUSTMENT

1. Test equipment connection is shown in figure (Fig 5)
2. Play the band 5 of test disc.
3. Adjust SV94 until monitor level at VTVM becomes $170\text{mV} \pm 10\text{mV}$

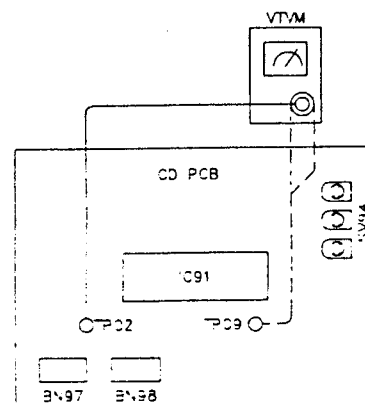


FIG5

CXA1081M (RF Amplifier)

N0.	SYMBOL	I/O	DESCRIPTION
1	RFI	I	Input pin with coupling capacitor where the RF summing amplifier output is connected.
2	RFO	O	Output pin of RF summing amplifier and check point of the eye pattern.
3	RF	I	Feedback input pin of the RF summing amplifier.
4	P/N	I	Switching pin of the LD P - sub/N - sub (DC voltage: At N - sub)
5	LD	O	Output pin of the APC LD amplifier DC voltage: At N - sub and pin 6 open
6	PD	I	Input pin of the APC PD amplifier (DC voltage: Open)
7	PD1	I	Inversion input pin of the RF I - V amplifier (1); with the pin photo diode of A and C connected
8	PD2	I	Inversion input pin of the RF I - V amplifier (2); with the pin photo diode of B and D connected
9	VC		For split power supply. GND For single power supply: VR(pin 14)
10	F	I	Inversion input pin of the FI - V amplifier, with the pin photo diode of F connected
11	E	I	Inversion input pin of the EI - V amplifier, with the pin photo diode of E connected
12	ED	O	Output pin of the EI - V amplifier
13	EI	I	Feedback input pin of the EI - V amplifier For gain adjustment of the EI - V amplifier
20	TE	O	Output pin of the tracking error amplifier
14	VR	O	Output pin of $(V_{cc} + V_{ee})/2$ DC voltage
15	CC2	I	Input pin (with coupling capacitor) where the Defect bottom - hold output is connecting.
16	CC1	O	Output pin of the Defect bottom hold
21	DEFECT	O	Output pin of the defect comparator (DC voltage: at 10k load)
24	CB	I	Connection pin of the Defect bottom hold capacitor
17	Vee	—	For split power supply: Negative power supply For single power supply: GND
18	FEBIAS	I	Feedback input pin of the focus error amplifier For CMR (Common Mode Rejection) adjustment of the focus error amplifier
19	FE	O	Output pin of the focus error amplifier
22	MIRR	O	Output pin of the MIRR comparator (DC voltage: at 10k load)
23	CP	I	Feedback input pin of the MIRR comparator
25	DGND	—	For split power supply: GND For single power supply: GND (Vee)
26	ASY	I	Input pin of the auto asymmetry control amplifier
27	EFM	O	Output pin of the EFM comparator (DC voltage: at 10k load)
28	FOK	O	Output pin off the FOK comparator (DC voltage: at 10k load)
29	LDOK	I	Switching pin of the LD ON/OFF (DC voltage: For LD on)(DGND)
30	Vcc	—	Positive power supply

CXA1082AQ(Servo Signal Processor)

NO.	SYMBOL	DESCRIPTION
2	FGD	Connect a capacitor between this pin and pin 3 to reduce the high - frequency gain.
3	FS3	The high - frequency gain of the focus servo can be changed by switching FS3 ON or OFF.
4	FLB	Time constant external pin for rising low bandwidth of the focus servo.
5 11 14 39	FEO TAO SLO SPDLO	OP amplifier output pins for the power Transister driver.
6	FE —	Reverse input pin for the focus amplifier.
7	SRCH	Pin for providing a time constant to generate the focus search waveform.
8	TGU	Pin for providing a time constant to switch the tracking gain of high - frequency.
9	TGZ	Pin for providing a time constant to change the high - frequency tracking gain.
12	TA —	Reverse input ; in for the tracking amplifier.
13	SL +	Non - reverse input pin for the sled amplifier.
15	SL —	Reverse input pin for the sled amplifier.
16	SSTOP	Pin for detecting a signal for the ON/OFF limit switch of the innermost part of the disc.
17	FSET	Pin for setting the peak frequency of the focus, tracking phase compensation and to of the CLV LPF
18 20	SENS COUT	Output pins for interfacing with the microcomputer.
21 22 23 24 25 33	DIRECT KRST DATA XLT CLK LOCK	Input pins for interfacing with the microcomputer. 47k pull - up resistor is inserted pins 21 and 33.
27	BW	Pin for providing a time constant for the loop filter.
28	PDI	Input pin for the CX23035/CXD 1135 phase comparator output PDO.
29	ISET	Current is input, determining the peaks of focus search, track jump, and sled kick.
30	VCOF	The free - running frequency of VCO is almost proportional to the resistance value between this pin and pin 31.
32	C864	Output pin 8.64 MHz VCO.
34	MDP	Pin for connecting the CX23035/CXD1135 MDP pin.
35	MON	Pin for connecting the CX23035/CXD1135 MON pin.
36	FSW	Pin for providing an external LPF time constant of the CLV servo error signal.
38	SPDL —	Reverse input pin for the spindle drive amplifier.
40 42 43 44	WDCK FOK MIRR DECT	Input pins for interfacing with the microcomputer.
45	TE	Input pin for tracking error signals.

NO.	SYMBOL	DESCRIPTION
46	TEC	Input pin for the zero - cross tracking comparator.
47	ATSC	Input pin of the window comparator for ATSC detection.
48	FE	Input pin for focus error signals.

MSM6404 PIN DESCRIPTION

PIN No	SYMBOL	I/O	DESCRIPTION
1	DG 5	I/O	DIGIT 5
2	PWON	I/O	SYSTEM POWER CONTROL(HIGH ACTIVE)
3	OPEN	I/O	LOADING MOTOR CONTROL OUT
4	CLOSE	I/O	LOADING MOTOR CONTROL OUT
5	FESW	I/O	FEED LIMIT SWITCH IS CONNECTED
6	OPSW	I/O	OPEN LIMIT SWITCH IS CONNECTED
7	CLSW	I/O	CLOSE LIMIT SWITCH IS CONNECTED
8	LDON	I/O	SWITCHING PIN OF LD ON/OFF
9	OSCO	I/O	OUT FROM OSCILLATOR(f = 4.0 MHz)
10	OSCI	I/O	INPUT TO OSCILLATOR CIRCUIT(f = 4.0 MHz)
11	XRST	I	SYSTEM RESET INPUT TERMINAL
12	TEST	O	(TEST TERMINAL FOR MAKER)
13	REMT	I	INPUT FOR REMOCON SIGNAL
14	FOK	I	INTERFACE FOR RF AMP & SERVO PROCESSOR
15	GF5	I	INTERFACE FOR D.S.P
16	SCOR	I	INTERFACE FOR D.S.P
17	DEMP	I/O	DE - EMPHASIS SIGNAL OUTPUT
18	SQCK	I/O	INTERFACE FOR D.S.P
19	MUTE	I/O	INTERFACE FOR D.S.P(COMMO FOR AUDIO)
20	SUBQ	I/O	INTERFACE FOR D.S.P
21	GND	—	POWER SOURCE VOLTAGE SUPPLY
22	SENSE	I/O	INTERFACE FOR D.S.P & S.S.P
23	DATA	I/O	INTERFACE FOR D.S.P & S.S.P
24	XLT	I/O	INTERFACE FOR D.S.P & S.S.P
25	CLK	I/O	INTERFACE FOR D.S.P & S.S.P
26 - 29	KIO - KI3	I/O	INPUT FOR KEY MATRIX
30 - 37	SGa - SGh	I/O	OUTPUT FOR SEGMENT
38 - 41	DG1 - DO4	I/O	OUTPUT FOR DIGIT
42	VDD		POWER SOURCE VOLTAGE SUPPLY

TERMINAL FUNCTION

CXD 1167

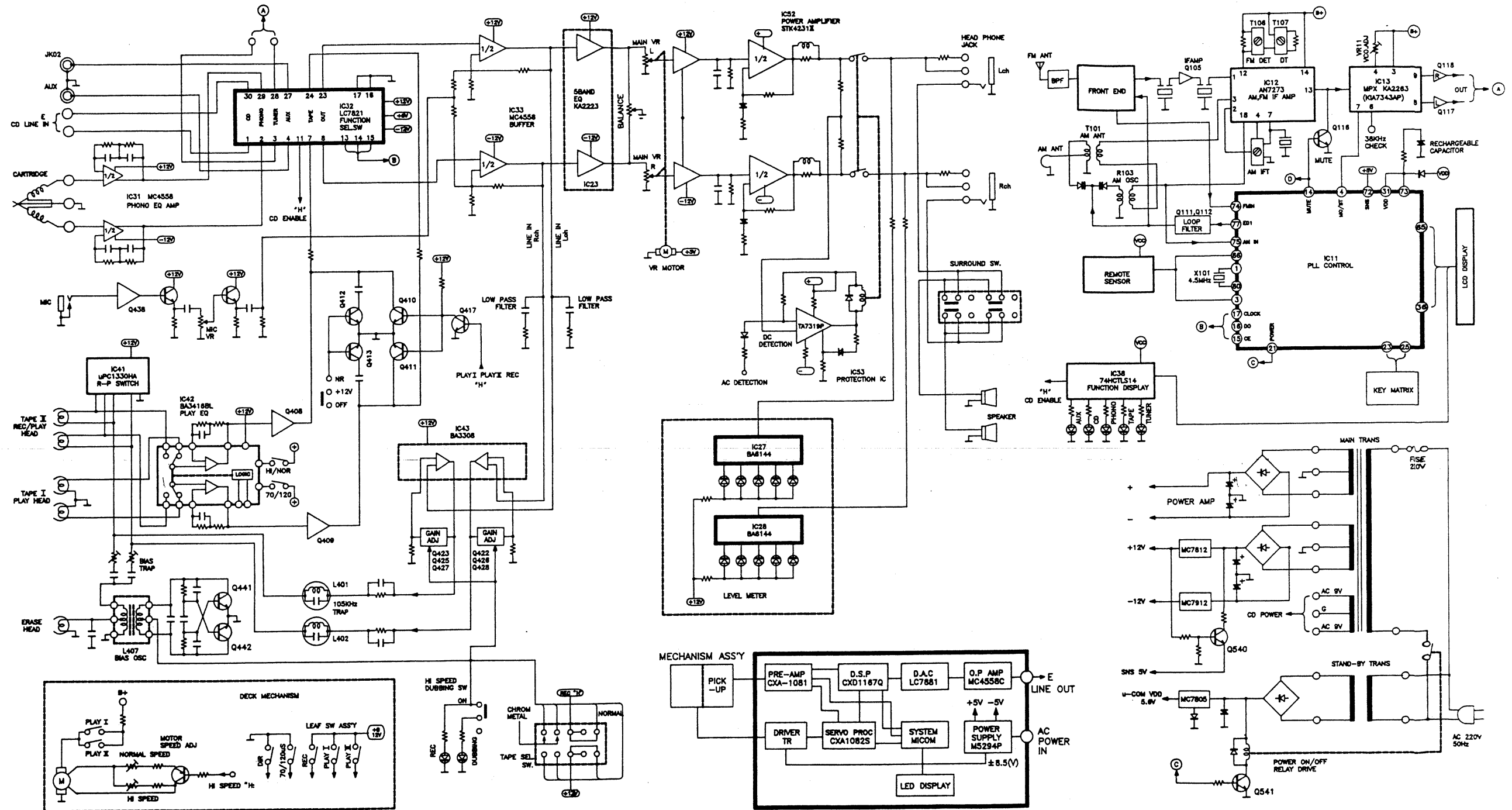
(Digital Signal Processor)

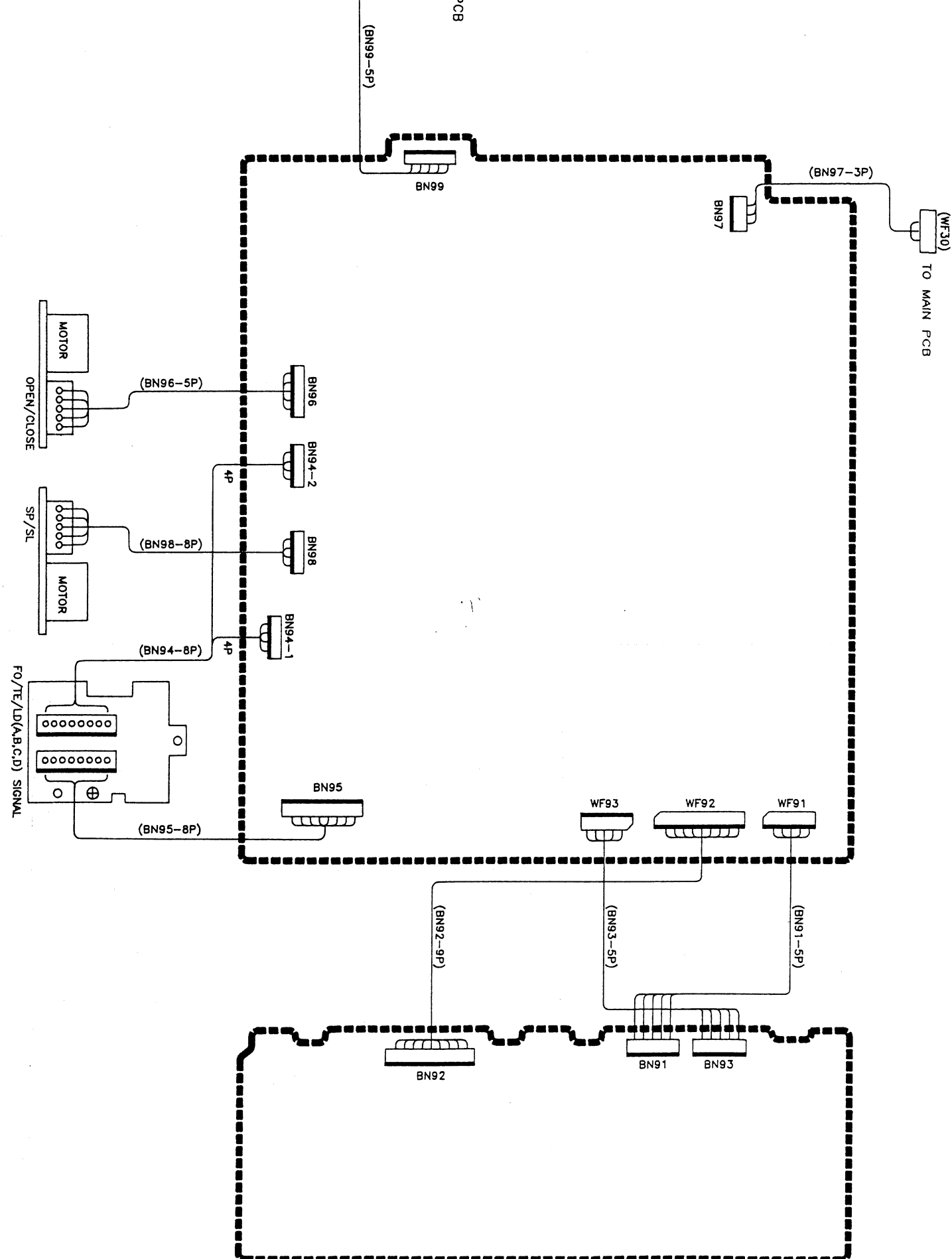
No.	SYMBOL	I/O	DESCRIPTION
1	FSW	O	Pin 1 output is switched constant when output filter of the spindle motor is energized.
2	MON	O	ON/OFF control for spindle motor.
3	MDP	O	Spindle motor drive. Provides rough control during CLV - S mode and phase control during CLV - P mode.
4	MDS	O	Spindle motor drive. Controls speed during CLV - P mode.
5	EFM	I	EFM signal from RF amplifier.
6	ASY	O	Controls slice level of the EFM signal
7	LOCK	O	The output of pin 7 reflects the status of the GFS signal which is sampled at WFCK/16. When the GFS signal is "H", the output of pin 7 is also "H", but, when the signal has remained "L" for at least 8 samples, the output of pin 7 is "L".
8	VCOO	O	VCO output The frequency is $f = 8.6436\text{MHz}$, when locked by the WFCK signal.
9	VCOI	I	VCO input.
10	TEST	I	(OV)
11	PDO	O	The output of Pin 11 provides phase comparison of EFM signal and VCO/2.
12	Vss	—	GND(OV)
13	CLK	I	Pin 13 provides serial transmission clock from the CPU. Data is latched on the leading edge of the clock.
14	XLT	I	Pin 14 provides latch input from the CPU. 8 bit shift register data (serial data received from the CPU) is latched in each of the registers.
15	DATA	I	Serial data from the CPU.
16	XRST	I	System reset ("L")
17	CNIN	I	Tracking pulse input.
18	SENS	O	Output reflecting internal condition as designated by address.
19	MUTG	I	Muting input. MUTG is "L" when ATTM of internal register A is "L" (normal condition). MUTG is "H" when muting condition is set.
20	CRCF	O	Output the results CRC check of subcode Q.
21	EXCK	I	Clock input for subcode serial output.
22	SBSO	O	Serial output of subcode.
23	SUBO	O	Output of subcode Q.
24	SCOR	O	Output of subcode sync S0 + S1.
25	SQCK	I/O	Clock for reading subcode Q.
26	SQEX	I	Input for selecting SQCK. (See page 28.)
27	DOTX	O	Digital output (WFCK is output when DO is off or for the CXD1130Q.)
28	GFS	O	Display output for frame sync lock status.
29	TEST	I	Fixed "L"

No.	SYMBOL	I/O	DESCRIPTION
30	TEST	I	Fixed "L"
31	TEST	I	Fixed "L"
32	TEST	I	Fixed "L"
33	VDD	—	POWER SUPPLY (5V)
34	TEST	I	Fixed "L"
35	TEST	I	Fixed "L"
36	TEST	I	Fixed "L"
37	TEST	I	Fixed "L"
38	TEST	I	Fixed "L"
39	TEST	I	Fixed "L"
40*	TEST	I	Fixed "L"
41	TEST	I	Fixed "L"
42	TEST	I	Fixed "L"
43	TEST	I	Fixed "L"
44	TEST	I	Fixed "L"
45	TEST	I	Fixed "L"
46	TEST	I	Fixed "L"
47	TEST	I	Fixed "L"
48	TEST	I	Fixed "L"
49	TEST	I	Fixed "L"
50	TEST	I	Fixed "L"
51	CAM	O	Divider output for crystal. $f = 4.2336\text{MHz}$
52	Vss	—	GND(0V)
53	XTAI	I	Input to crystal oscillator circuit. Depending on the mode the frequency is either. $f = 8.4672$ or 16.9344MHz
54	XIAO	O	Output from crystal oscillator circuit. Depending on the mode the frequency is either. $f = 8.4672$ or 16.9344MHz
55	MD1	I	Mode selection input 1.
56	MD2	I	Mode selection input 2.
57	MD3	I	Mode selection input 3.
58	SLOB	I	Code switch input for audio data output. 2's complement output when "L", off set binary output when "H".
59	PSSL	I	Code switch input for audio data output. Serial output when "L", parallel output when "H".
60	APTR	O	Control output for aperture compensation. "H" when R - ch.

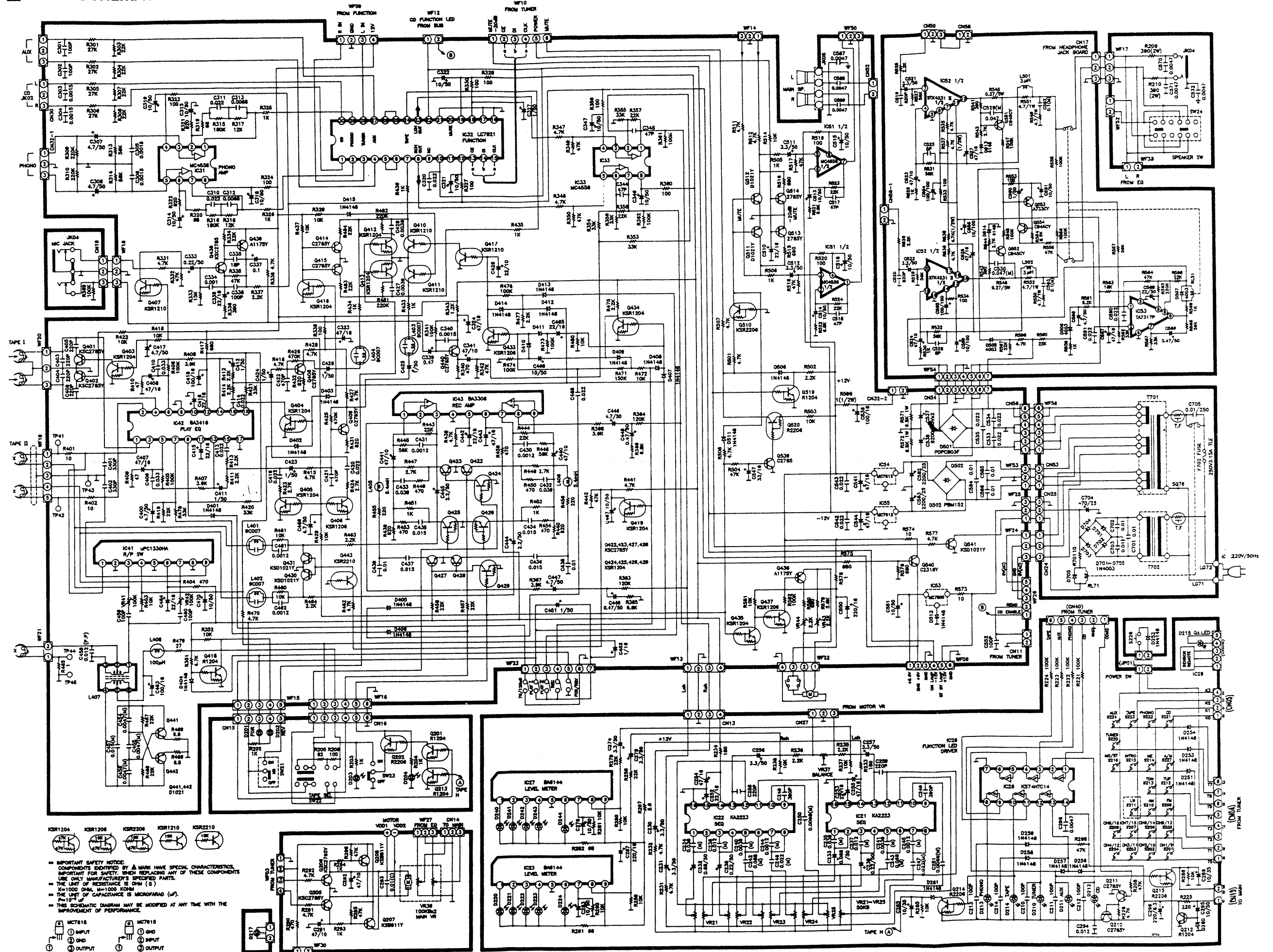
No.	SYMBOL	I/O	DESCRIPTION
61	APTL	O	Control output for aperture compensation. "H" when L - ch.
62	DA01	O	DA01 (LSB of parallel audio data) is output when PSSL = "H". C1F1 is output when PSSL = "L".
63	DA02	O	DA02 is output when PSSL = "H". C1F2 is output when PSSL = "L".
64	DA03	O	DA03 is output when PSSL = "H". C2F1 is output when PSSL = "L".
65	DA04	O	DA04 is output when PSSL = "H". C2F2 is output when PSSL = "L".
66	DA05	O	DA05 is output when PSSL = "H". C2FL is output when PSSL = "L".
67	DA06	O	DA06 is output when PSSL = "H". C2PO is output when PSSL = "L".
68	DA07	O	DA07 is output when PSSL = "H". RFCK is output when PSSL = "L".
69	DA08	O	DA08 is output when PSSL = "H". WFCK is output when PSSL = "L".
70	DA09	O	DA09 is output when PSSL = "H". PLCK is output when PSSL = "L".
71	DA10	O	DA10 is output when PSSL = "H". UGFS is output when PSSL = "L".
72	DA11	O	DA11 is output when PSSL = "H". GTOP is output when PSSL = "L".
73	Vdd	—	Power supply (+5V)
74	DA12	O	DA12 is output when PSSL = "H". RAOV is output when PSSL = "L".
75	DA13	O	DA13 is output when PSSL = "H". C4LR is output when PSSL = "L".
76	DA14	O	DA14 is output when PSSL = "H". C2IO is output when PSSL = "L".
77	DA15	O	DA15 is output when PSSL = "H". C210 is output when PSSL = "L".
78	DA16	O	DA16(MSB of parallel audio data) is output when PSSL = "H". DATA is output when PSSL = "L".
79	WDCK	O	Strobe signal output. Output is 176.4kHz when DF is on. Output is 88.2kHz when DF is off
80	LRCK	O	Strobe signal output. Output is 88.2kHz when DF is on. Output is 44.1kHz when DF is off or when the chip being used is CXD1125Q.

■ BLOCK DIAGRAM

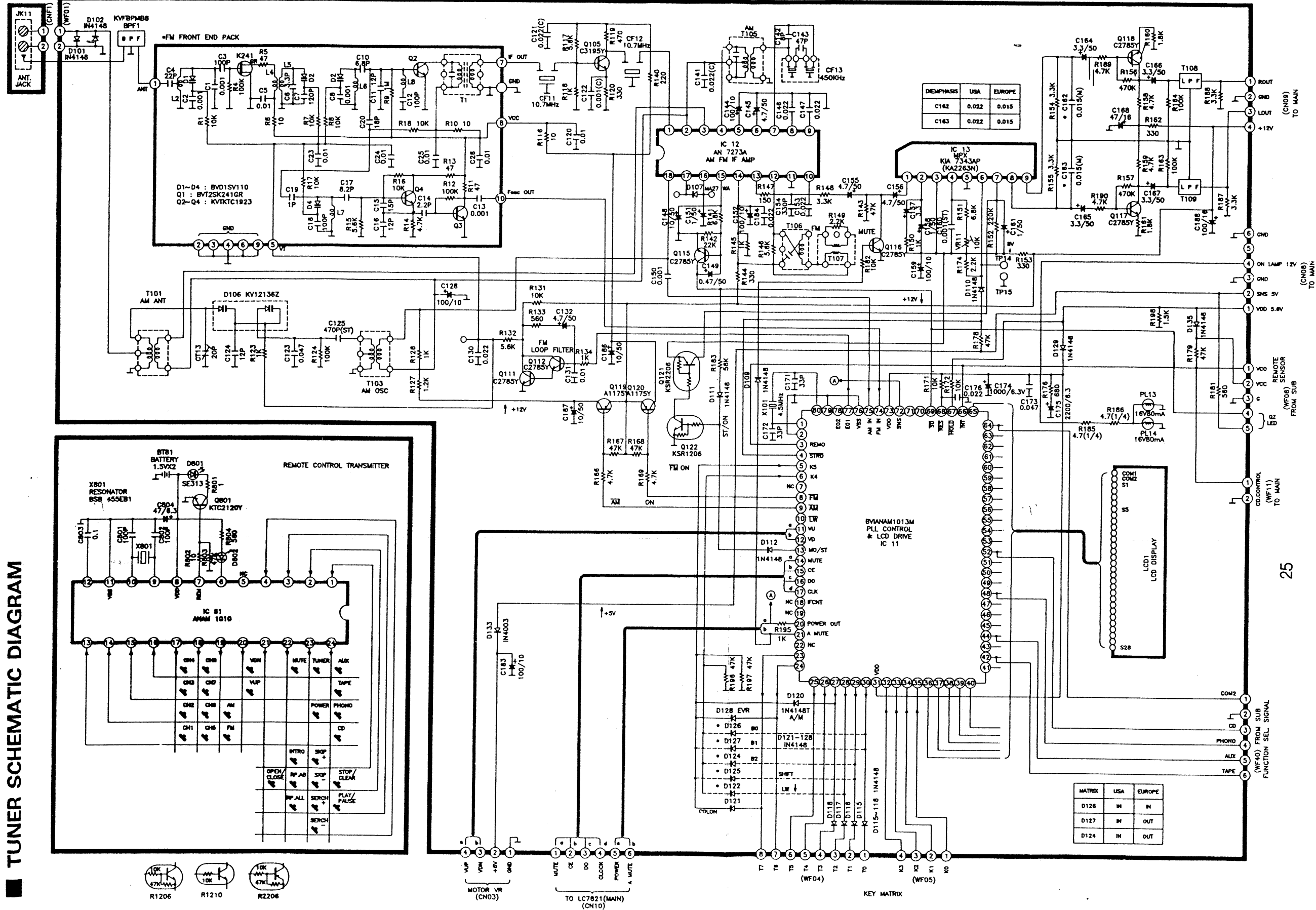




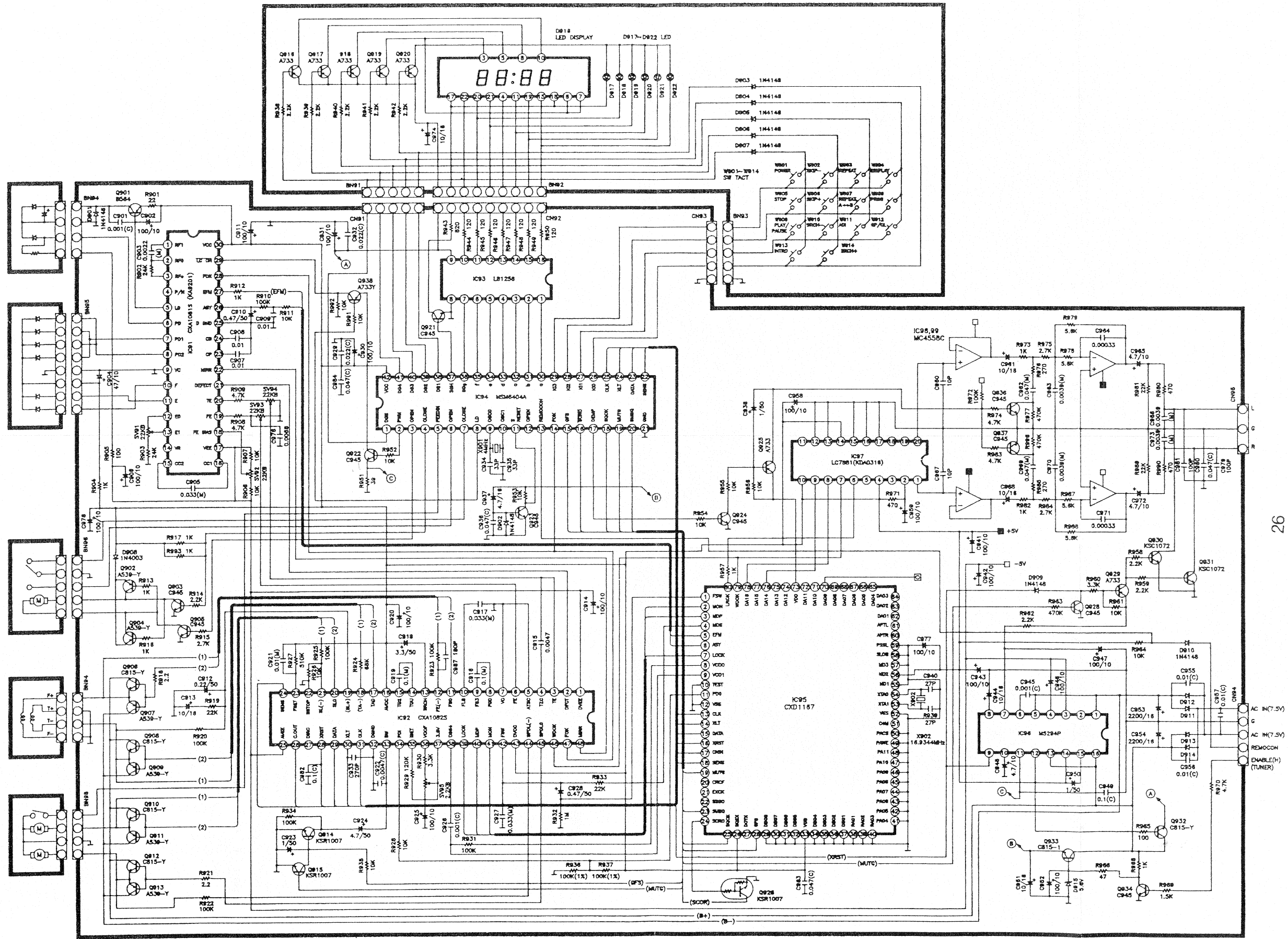
MAIN SCHEMATIC DIAGRAM



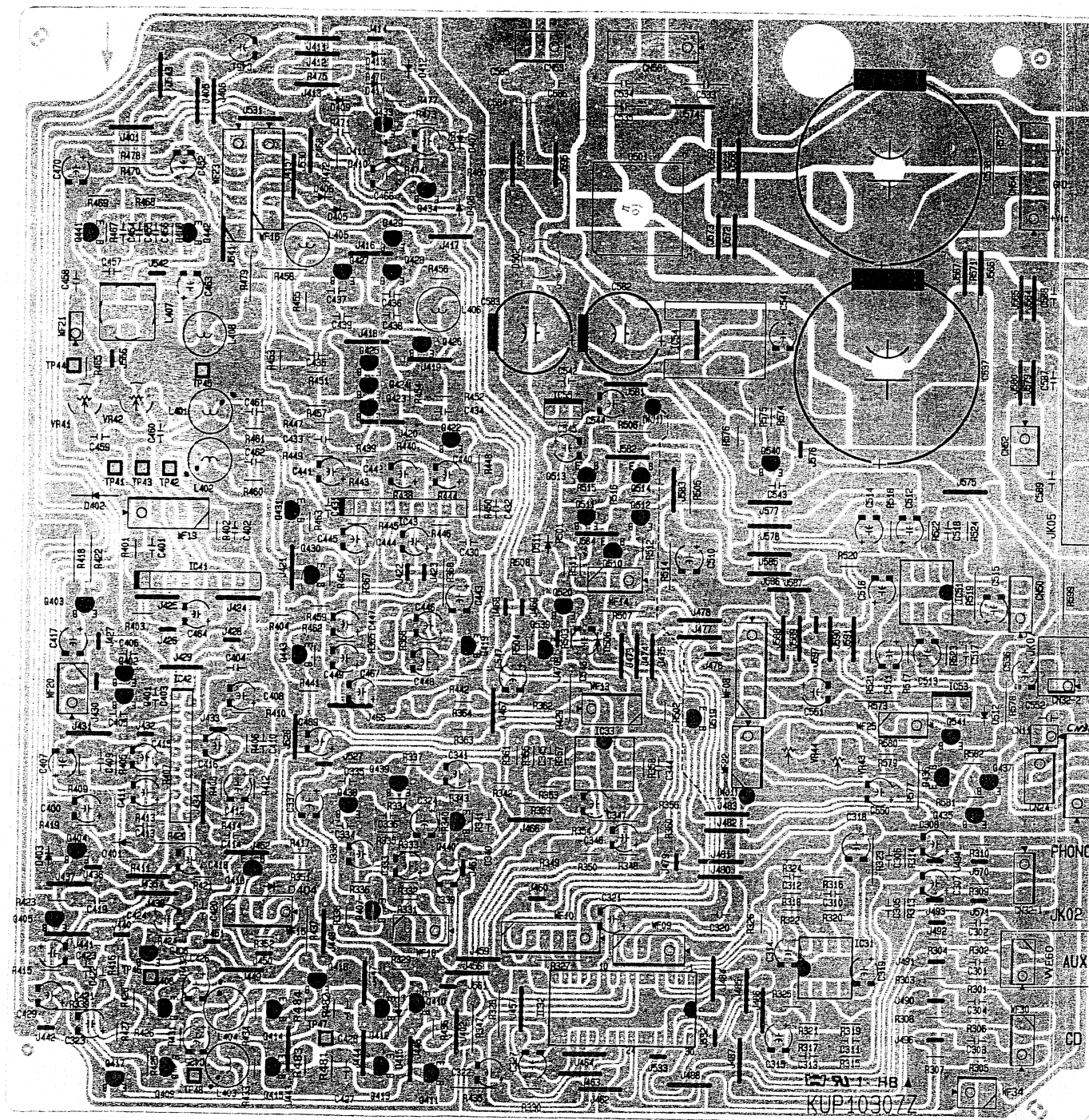
TUNER SCHEMATIC DIAGRAM



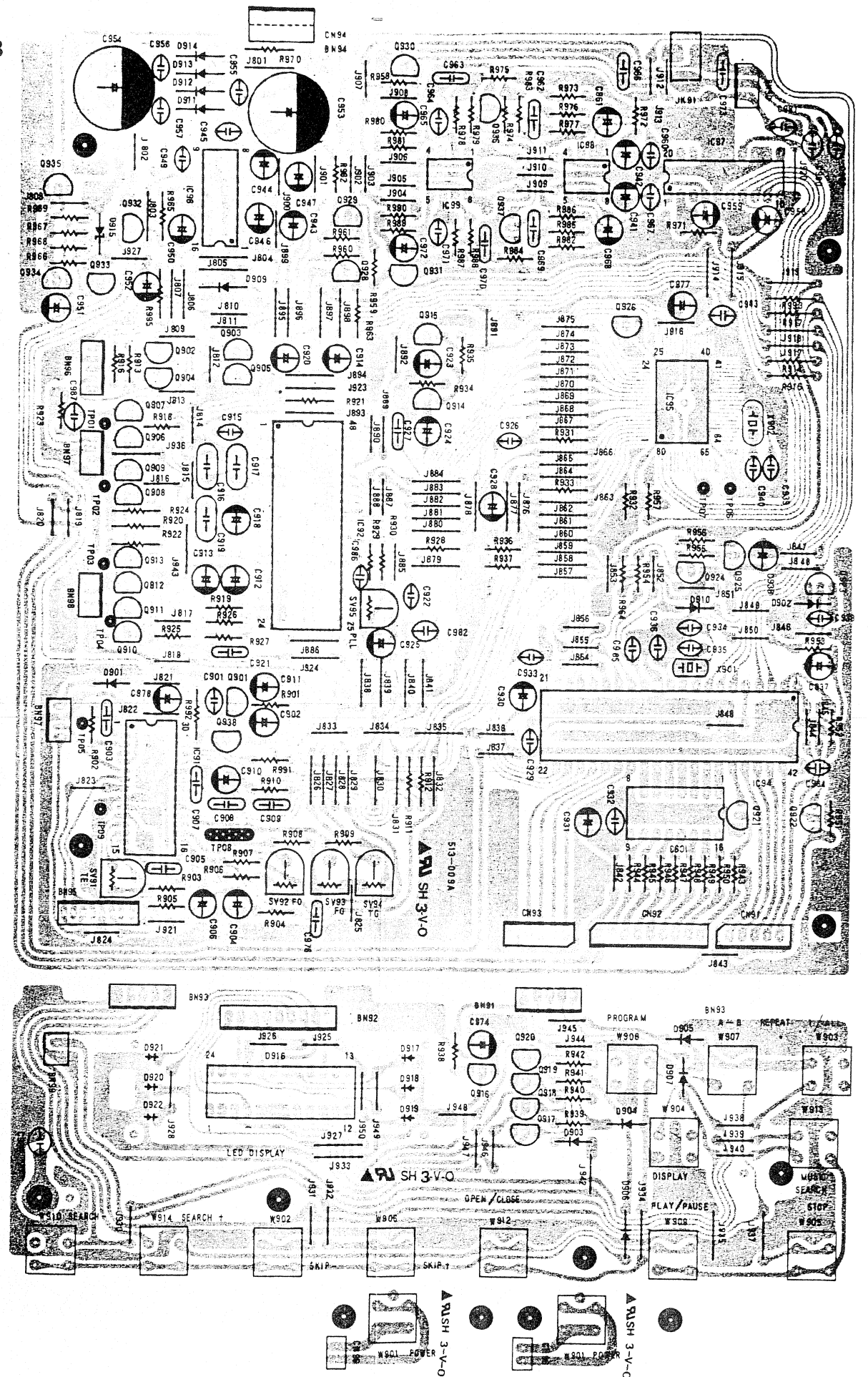
CDP SCHEMATIC DIAGRAM



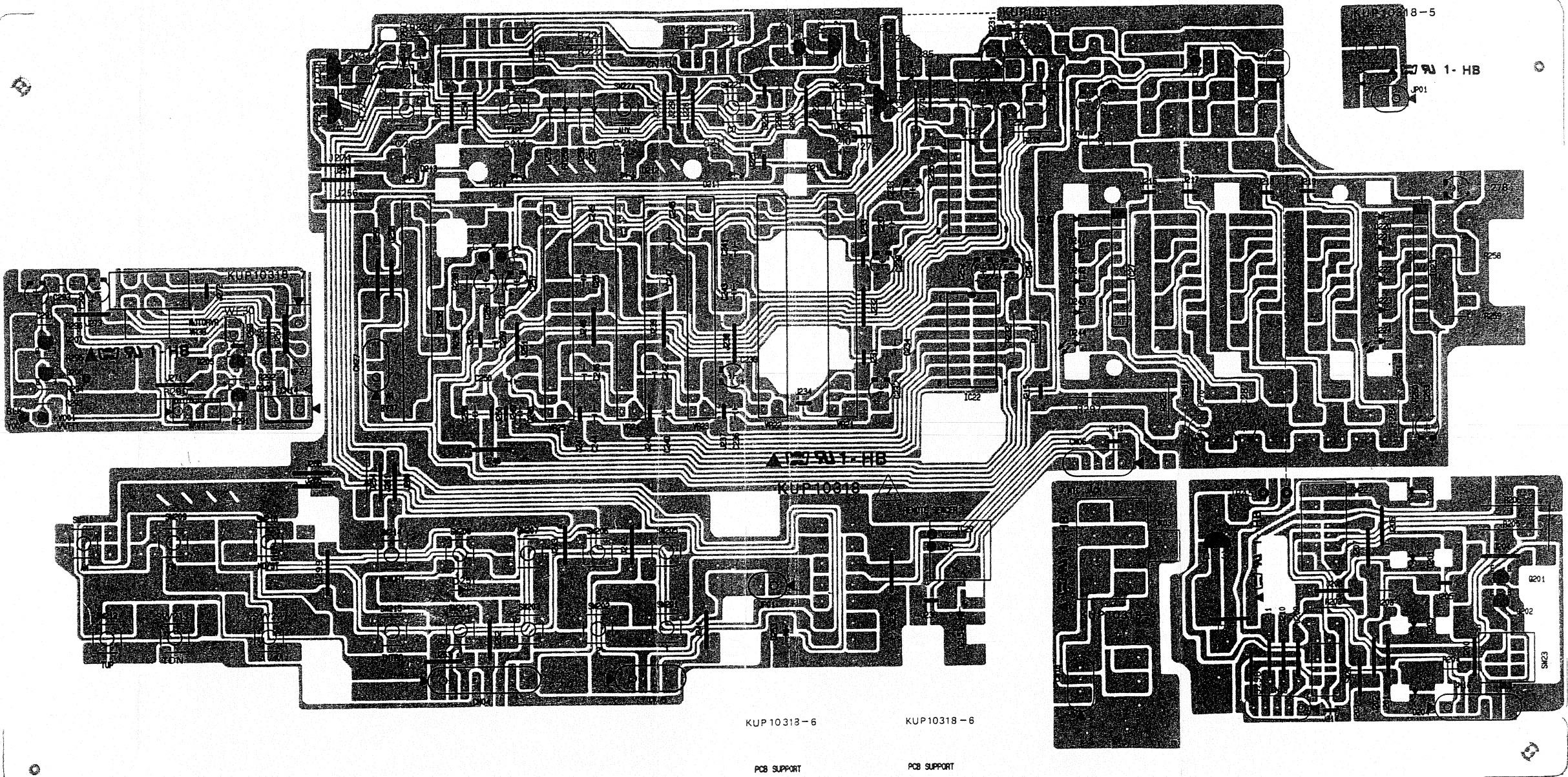
MAIN PCB



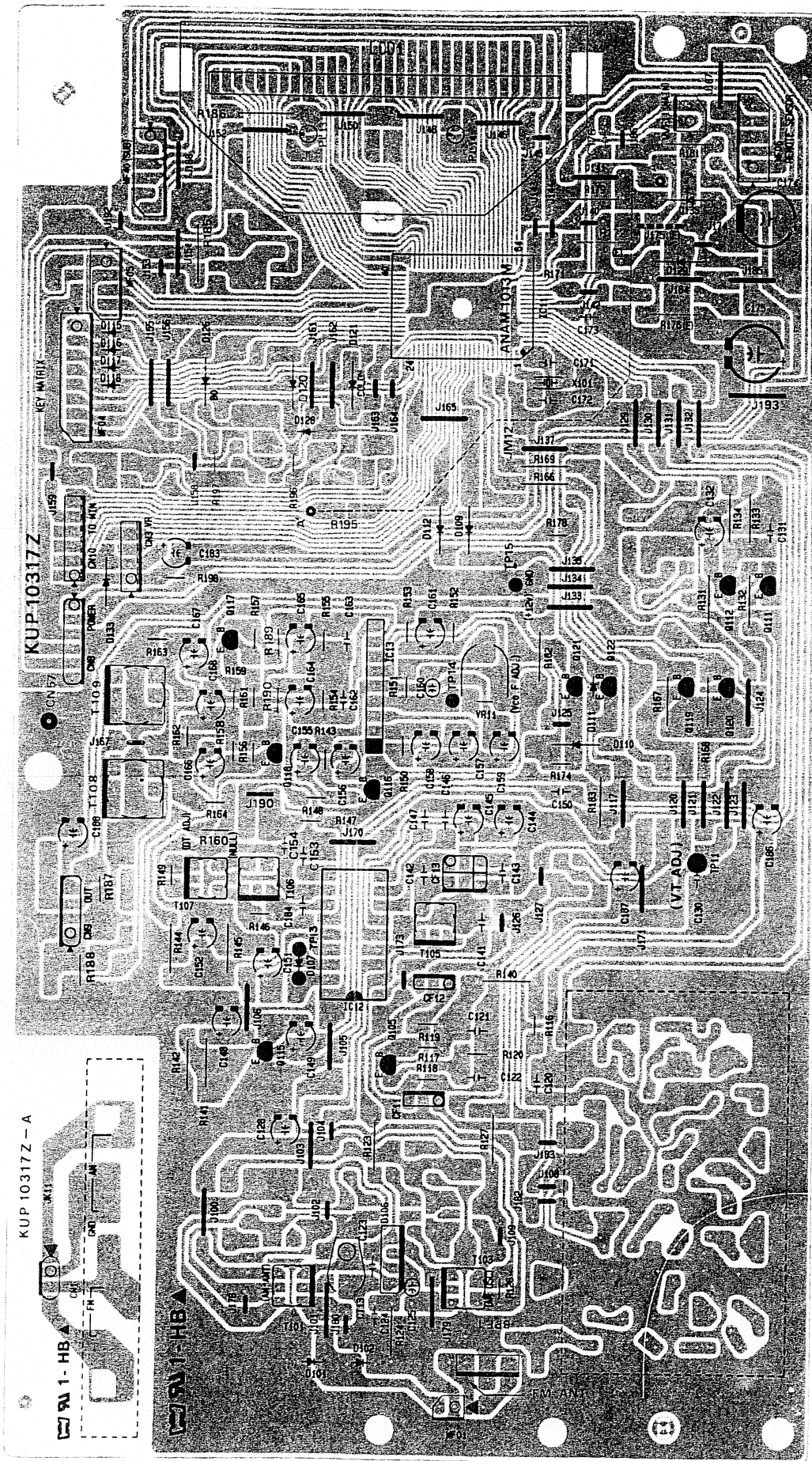
CD P PCB



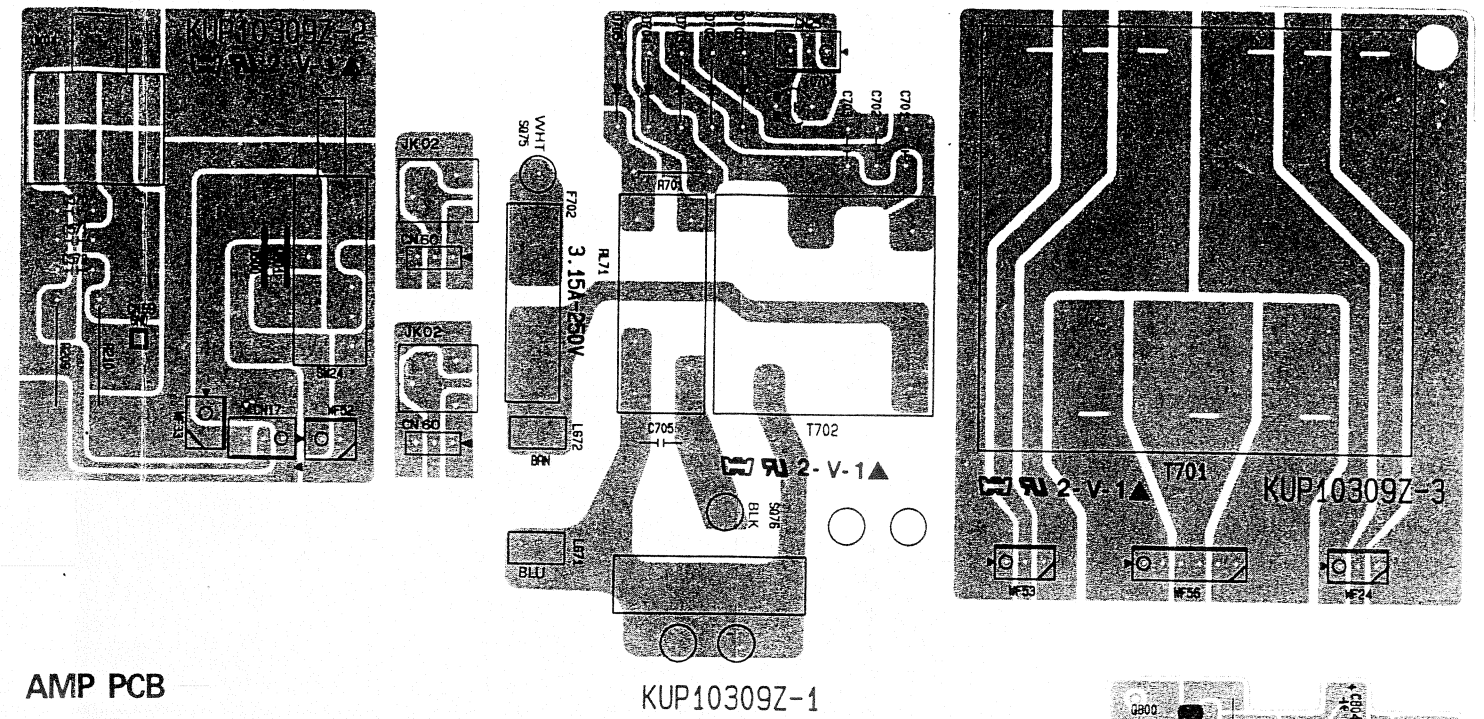
SUB PCB



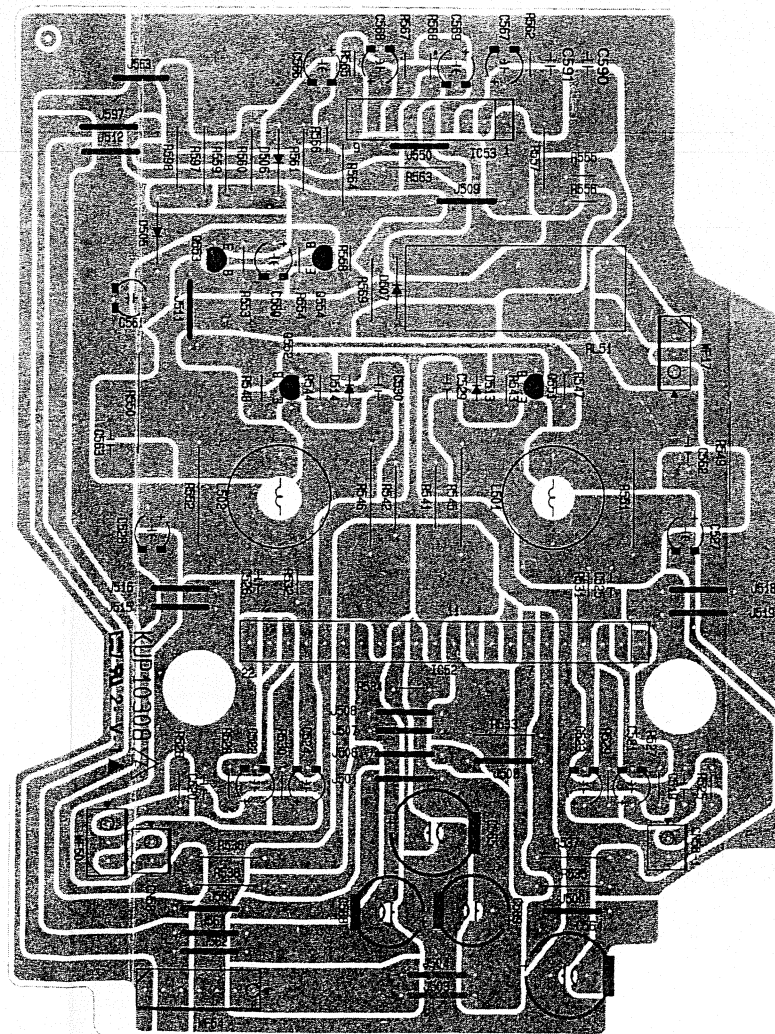
TUNER PCB



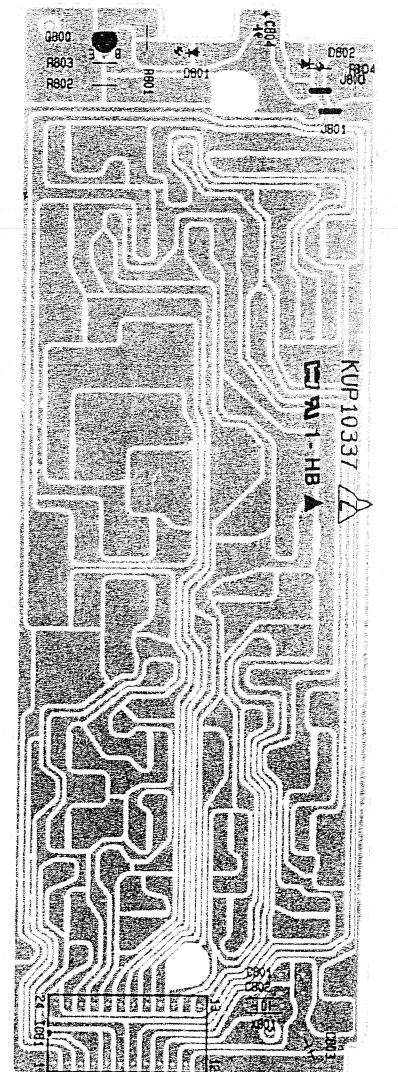
POWER PCB

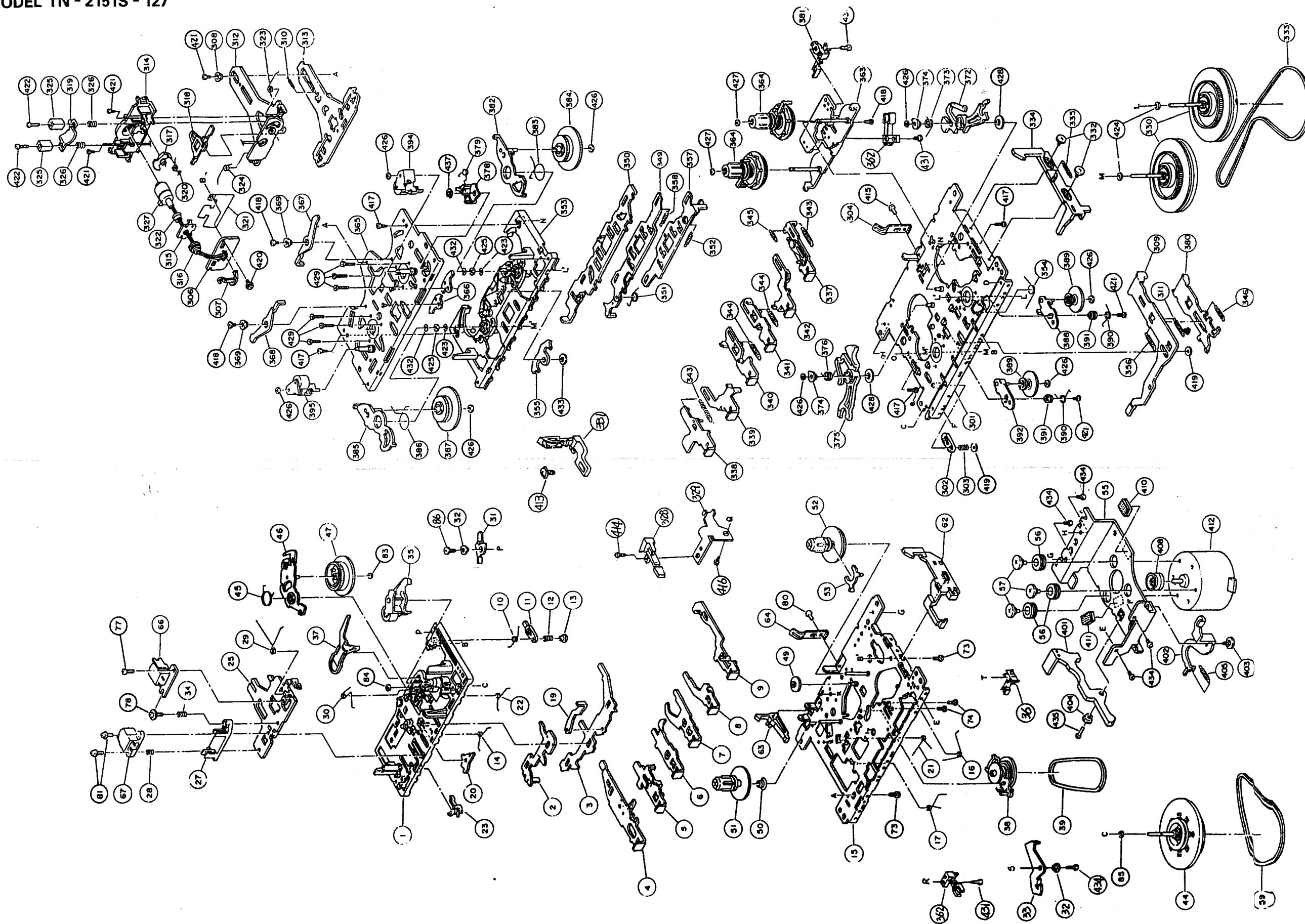


AMP PCB

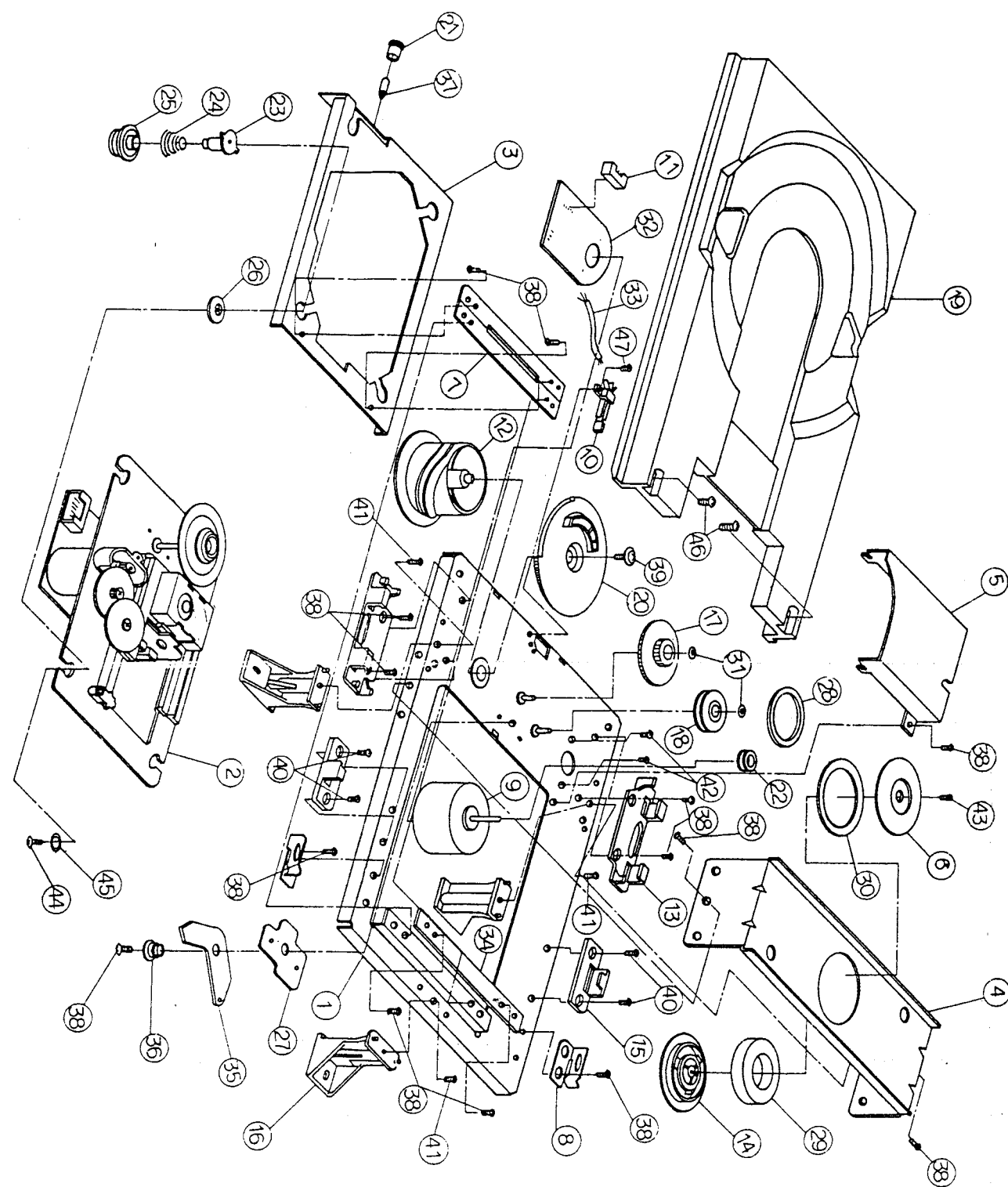


REMOTE PCB

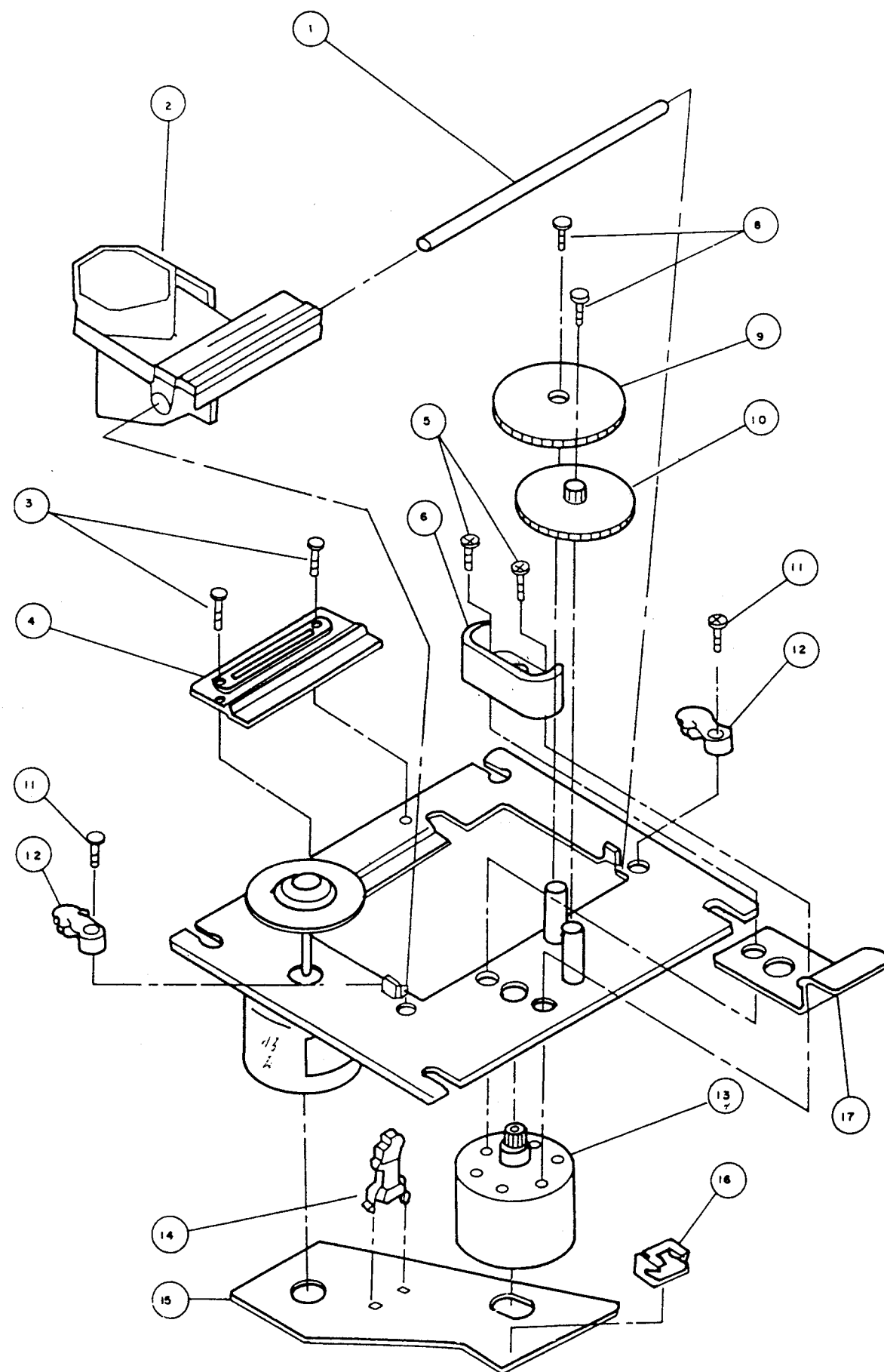




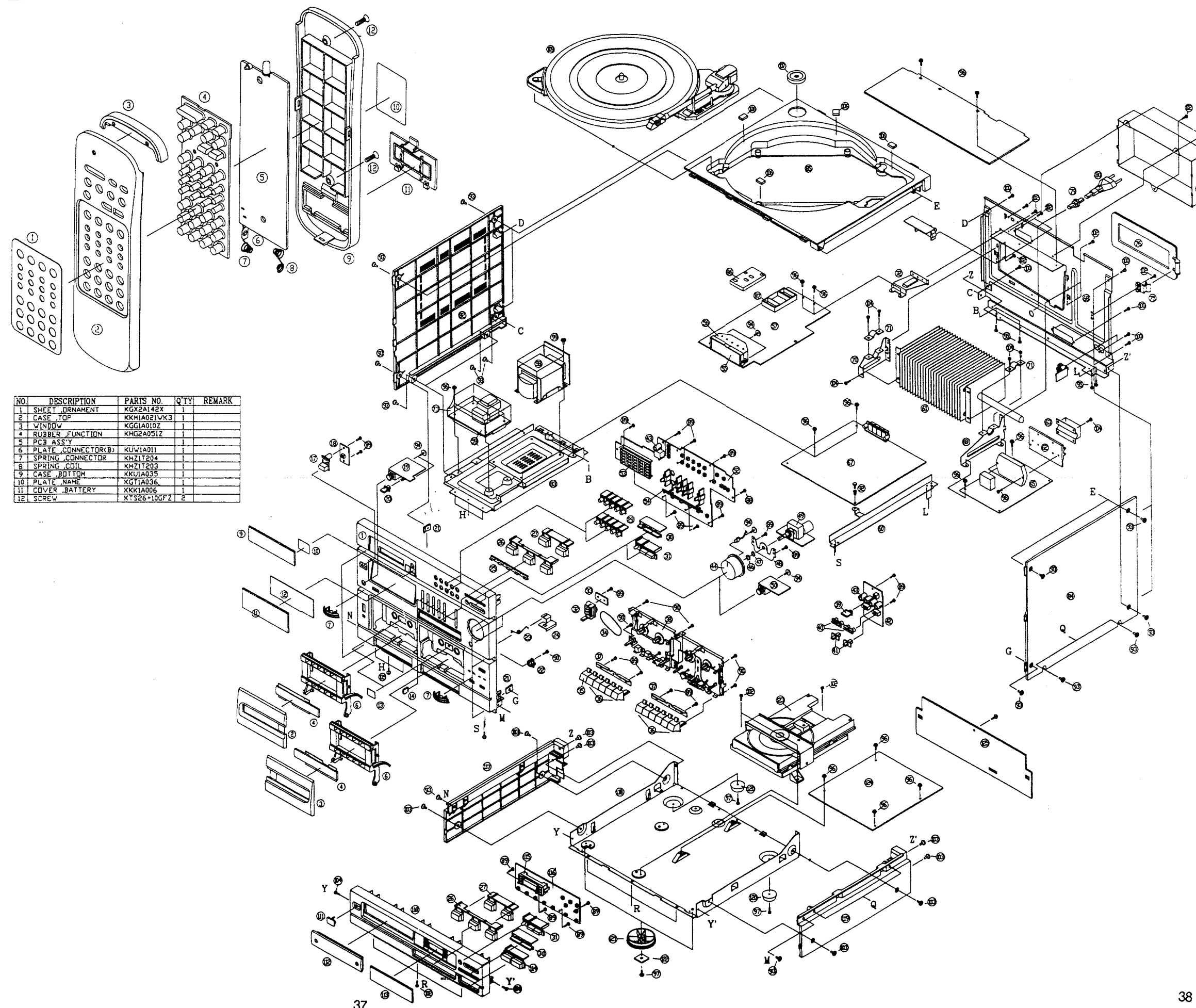
CD MECHANISM EXPLODED VIEW



EXPLODED VIEW/PARTS LIST • OPTICAL PICK-UP CARRIAGE



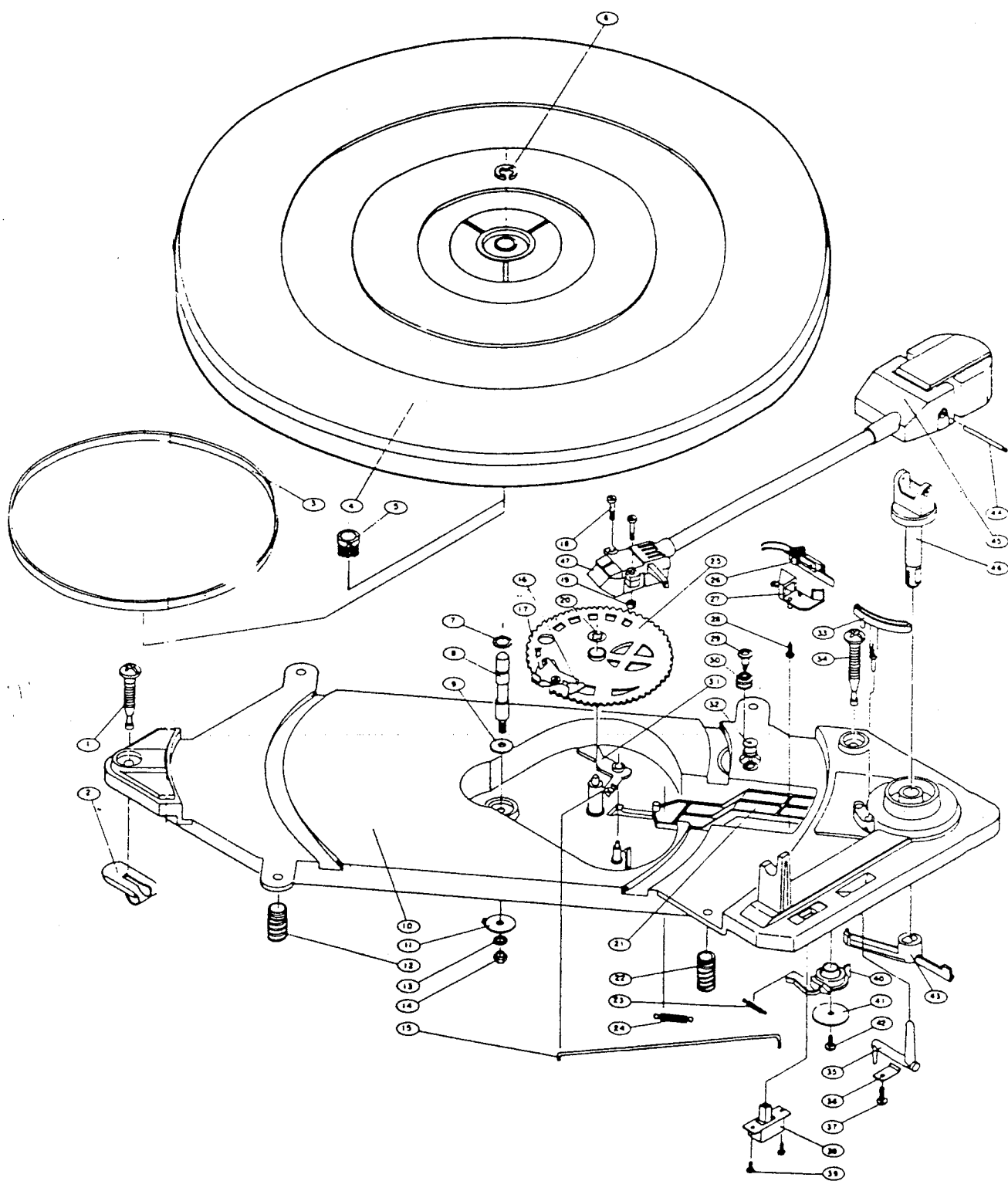
EXPLODED VIEW/PARTS LIST



NO.	PARTS - NO.	DESCRIPTION	QTY	REMARKS
1	KGV4A052YK3	PANEL FRONT	1	
2	KKR1A003TK3	DOOR BASE (L)	1	
3	KKR1A004TK3	DOOR BASE (R)	1	
4	KGU1A042W	DOOR (L)	2	
5				
6	KKG2A003	HOLDER CASSETTE	2	
7	KKL1A014Z	FOOT (A)	6	
8				
9	KGU1A058Z	WINDOW LCD	1	
10	KGU1A025Z	FILTER REMICON	1	
11	KGU1A059Z	WINDOW	1	
12	KMZ1A033X	LEVEL SHEET	1	
13	KKE11048	REFLECTOR	2	
14	KRD1A024Z	KNOB SLIDE	6	
15				
16				
17	KBT1A017	KNOB TACT (POWER)	1	
18	KUP10254-5	POWER SV PCB	1	
19	KUP10254-3	HAND PHONE PCB	1	
20	KBC1A067	KNOB PUSH	1	
21	KNE4046	U-NUT	2	
22	KMH0C332-1	DAMPER GEAR ASSY	2	
23	KTS2A001	SPRING HOLDER	2	
24	KMD1A093	BRACKET SPRING	2	
25	KQ1A014	INDICATOR LED	1	
26	KBT1A096X	KNOB FUNCTION (1)	1	
27	KBT1A097X	KNOB FUNCTION (2)	1	
28				
29	KBT1A094	KNOB TACT(B)	2	
30	KBT1A113	KNOB TACT	1	
31	KBT1A093	KNOB TACT(A)	1	
32	KQ1A014	COUNTER TAPE	1	
33	KUP10254-5	SUPPORT PCB	1	
34	KMG1A028	SEL COUNTER	1	
35	KBC1A069	KNOB DECK	1	
36	KBC1A053	KNOB DECK	1	
37	KMD1A094	BRACKET BUTTON	2	
38	KJUC1301X	MECHANISM DECK	1	
39	KK1A005	KNOB PUSH (LUMINANCE)	1	
40	KQ1A008	INDICATOR LED (A)	1	
41	KBD1A030Z	KNOB SLIDE	2	
42	KUP10254-2	TAPE SEL SV PCB	1	
43	KMH1A009	HOLDER LED	5	
44	KBN1A011T	KNOB ROTARY	1	
45				
46	KNE1A008	NUT	1	
47	KNV1A005	VASHER	1	
48	KML1A014	BRACKET MOTOR VOL	1	
49	KUP10254-7	VOLUME PCB	1	
50	KUP10254-4	MIC PCB	1	
51				
52	KOP10310Z8	SUB PCB	1	
53	KMH1A014	HOLDER LED (LEVEL)	1	
54	KMH1A017	FUNCTION LED HOLDER	1	
55	KMH1A018Z	FILTER LED	1	
56	KMP1A007	CASE LCD	1	
57	KOP10317Z8	TUNER PCB	1	
58				
59	KOP10309Z8	POWER PCB	1	
60	KUC1A008	FRAME	1	
61	KMY1A020	HEAT SINK	1	
62	KMY1A020-1	BLACK	1	
63	KMY1A020-2	SUPPORT	1	
64	KMD1A082X1	HEAT SINK CAP	1	
65	KOP10309Z8	AMP PCB ASSY	1	
66				
67	KOP10307Z8	MAIN PCB ASSY	1	
68	KKF1A032ZK1	REAR PANEL	1	
69	KMD1A105	HEAT SINK BRACKET(R)	1	
70	KMD1A104	HEAT SINK BRACKET(L)	1	
71	KMD1A106	HEAT SINK CLIP	2	
72	KMD1A107	BRACKET TUNER	1	
73	KMX1A031	INSULATOR	1	
74				
75	KMA1A003	HOLDER LOOP ANT	1	
76	KSA1A001	LOOP ANT	1	
77	KKU1A037	BOARD(CANT-THERMO)	1	
78				
79	KMH129	BUSHING AC CORD	1	
80	KJA2B010Z	CORD POWER	1	
81				
82	KKD1A009	COVER SIDE (L) MC	1	
83	KKUA1A043	CHASSIS BOTTOM	1	
84	KKH1A013	COVER SIDE (R) MC	1	
85	KGV1A024	BASE PLAYER	1	
86	KMC1A030	FM SHIELD CASE	1	
87	KMC1A034	CASE	1	
88	KTB3+6G	SCREW	2	
89	KTB3+6G	SCREW	20	
90	KTB3+10G	SCREW	9	
91				
92	KRE1A012	SNAP RIVET	1	
93	KTB4+12GFZ	SCREW	8	
94	KTV3+8G	SCREW	6	
95	KTB3+8G	SCREW	6	
96	KTV3+8J	SCREW	10	
97	KTV3+8J	SCREW	2	
98	KTB3+16J	SCREW	2	
99	KTB4+8P	SCREW	4	
100	KTB3+10GFZ	SCREW	4	
101	KTB3+8G	SCREW	4	
102	KTB3+8GFZ	SCREW	6	
103	KTB3+6JFZ	SCREW	6	
104	KTB3+8J	SCREW	5	
105	KIX1V2+8JFZ	SCREW	2	
106	KTB4+12JFZ	SCREW	8	
107	KBM1A001	CUSHION PLATTER	2	
108	KY5018-2	ADAPTOR 4SRPH	1	
109	KAP-13580A	PLAYER BODY ASSY	1	
110	Z98-001A-1	PANEL FRONT	1	
111	KGR1A018V	ORNAMENT POWER	1	
112	Z26-001A-1	DOOR ORNAMENT	1	
113	Z26-001A	WINDOW	1	
114	Z73-001A	KNOB PLAY	1	
115	S87-001A	HOLDER LED	1	
116				
117	KKB2A012	COVER SIDE LCD	1	
118	Z23-001A	CHASSIS BOTTOM	1	
119	KKB2A011	COVER SIDE (RCD)	1	
120	KKL1A007	FOOT REAR	2	
121	KKL1A016Z	FOOT FRONT	2	
122	KHG1A050	FOOT RUBBER	1	
123	119-001A	MECHANISM CD	1	
124				
125	KKU1A036ZK1	PCB MAIN	1	
126		BOARD REAR (CD)	1	

ZEILE	POSITION	SYM	BEZEICHNUNG	ET-NUMMER
1			LAUTSPRECHERBOX KPL.	749 222 6
2				
3			FERNBEDIENUNG, GEBER	749 137 6
4			BATT.-DECKEL, GEBER	749 182 2
5				
6			<u>RACK :</u>	
7				
8			GLASTUERE 755X392X4 MM	749 223 4
9			SCHARNIER, PAAR FUER GLASTUER	740 736 4
10			GLASDECKEL 405X392X4 MM	749 224 2
11			SCHARNIER FUER GLASDECKEL	733 526 8
12			KUNSTSTOFFSCHRAUBE	742 419 5
13			GRIFF FUER GLASTUER	730 483 5
14			MAGNETDRUCKSCHNAPPER	742 422 9
15			SCHARNIERWINKEL	742 420 3
16			SCHARNIERBUCHSE	742 421 1
17			GELENKROLLE	731 765 4
18	A		CHROMGUEGEL 195X195 MM	988 478 4
19				
20			<u>GEHAEUSE UND BEDIENTEILE :</u>	
21				
22	1		FRONTBLENDE, RDF-TB	749 183 0
23	2		CASS.-DECKEL, LINKS	749 184 8
24	3		CASS.-DECKEL, RECHTS	749 185 5
25	4		CASS.-FENSTER	749 186 3
26	6		CASSETTENFACH	749 187 1
27	7		ZIERFUSS	749 188 9
28	9		SCHEIBE, DISPLAY-RDF	749 189 7
29	10		SCHEIBE, JR-EMPFAENGER	749 190 5
30	11		SCHEIBE, LED	749 191 3
31	12		FILTERSCHEIBE, LED	749 192 1
32	14		KNOPF, SCHIEBEREGLER	749 193 9
33	17		KNOPF, POWER	749 194 7
34	20		KNOPF, SPEAKER	749 195 4
35	22		DAEMPFER	749 196 2
36	23		FEDER, CASS.-AUSHURF	749 197 0
37	25		LED-INDICATOR	749 198 8
38	26		KNOPFLEISTE 3-FACH	749 199 6
39	29		KNOPFLEISTE 5-FACH	749 200 2
40	30		KNOPFLEISTE 2-FACH	749 201 0
41	31		KNOPFLEISTE 3-FACH	749 202 8
42	32		ZAHLWERK	749 203 6
43	34		RIEMEN	749 204 4
44	35		KNOPF, CASSETTE-REC	749 205 1
45	36		KNOPF, CASSETTE	749 206 9
46	38		CASSETTENLAUFWERK	749 171 5
47	39		KNOPF, LUDNESS	749 207 7
48	41		KNOPF, SCHIEBESCHALTER	749 208 5
49	44		KNOPF, VOLUME	749 209 3
50	58		NETZTRAFO STAND-BY	749 166 5
51	59		NETZTRAFO, GROSS	749 165 7
52	75		HALTER FUER RAMENANT.	749 210 1
53	76		MW-RAMENANTENNE	749 170 7
54	82		SEITENTEIL, GROSS-LINKS	749 211 9
55	84		SEITENTEIL, GROSS-RECHTS	749 212 7
56	85		OBERTEIL, PH-AUFNAHME	749 213 5
57	108		PUCK REDUZIERST	177 551 9
58	109		PLATTENSPIELER	749 214 3
59	110		FRONTBLENDE, CD	749 215 0
60	112		BLENDE, CD-SCHLITTEN	749 216 8
61	113		SCHEIBE, DISPLAY-CD	749 217 6
62	114		KNOPFLEISTE 2-FACH	749 218 4
63	120		GEH FUSS	121 203 4
64	121		FUSS, VORNE	749 219 2
65	123		CD-MECHANIK	749 220 0
66				
67			<u>CD-MECHANIK :</u>	
68				
69			CD-MECHANIK	749 220 0
70	9		MOTOR, RF-510T	740 020 3
71	10		MIKROSCHALTER	747 179 0
72	12		KURVENRAD	747 178 2
73	19		CD-SCHLITTEN	747 177 4
74	28		RIEMEN	747 180 8
75				
76			<u>PICK-UP-CHASSIS :</u>	
77				
78	2		LASERABTASTEINHEIT 15026	749 780 3
79	9		ZAHLRAD-LASER	747 181 6
80	10		ZAHLRAD-MOTOR	747 182 4
81	13.1		MOTOR RF-310T-11400 D/V 4,0	743 390 7

ZEILE	POSITION	SYM	BEZEICHNUNG	ET-NUMMER
82	13.2		MOTOR RF-310T-11400 D/V 5,9	743 391 5
83	14		MIKROSCHALTER	746 736 8
84				
85			<u>CASSETTENLAUFWERK :</u>	
86				
87			CASSETTENLAUFWERK	749 171 5
88	2		SCHALTHEBEL	742 618 2
89	3		SCHALTSCHIEBE	742 619 0
90	4		TASTENSCHIEBER, REC.	742 620 8
91	5		TASTENSCHIEBER, PLAY	742 621 6
92	6		TASTENSCHIEBER, REW.	742 622 4
93	7		TASTENSCHIEBER, F.F.	742 623 2
94	10		PROFILFEDER	742 626 5
95	12		DRUCKFEDER, PAUSERAST	742 628 1
96	13		STOPFEN, PAUSERAST	742 629 9
97	14		PROFILFEDER	742 630 7
98	16		PROFILFEDER	742 631 5
99	17		PROFILFEDER	742 632 3
100	20		STOPPER	742 634 9
101	21		PROFILFEDER	742 635 6
102	22		PROFILFEDER	742 636 4
103	23		MIKRO-SCHALTER	999 543 2
104	29		PROFILFEDER	742 638 0
105	30		PROFILFEDER	742 639 8
106	34		FEDER	999 548 1
107	35		GA-ROLLE	742 641 4
108	37		FUEHLHEBEL	742 642 2
109	38		RUTSCHKUPPLUNG	742 643 0
110	39		RIEMEN 0,9 X 35MM	998 345 3
111	44		SCHWUNGRAD 2	742 645 5
112	45		PROFILFEDER	742 646 3
113	47		ZAHLRAD	742 648 9
114	49		ZAHLRAD, F.F.	742 649 7
115	51		ABWICKELTELLER	749 102 0
116	52		AUFWICKELTELLER	749 103 8
117	53		SCHALTFUEHLER	742 652 1
118	59		RIEMEN	743 883 1
119	66		A/W-KOPF	740 167 2
120	67		LOESCHKOPF	743 866 6
121	302		PAUSE-HEBEL	743 869 0
122	303		FEDER	999 538 2
123	323		FEDER FUER ANDRUCKROLLE, RECHTS	743 875 7
124	324		FEDER FUER ANDRUCKROLLE, LINKS	743 876 5
125	327		WIEDERGABEKOPF, KPL.	749 179 8
126	328		MIKROSCHALTER MSW 1473	749 180 6
127	330		SCHWUNGMASSE	749 870 2
128	331		MIKROSCHALTER, MSW-1664	743 867 4
129	333		RIEMEN	743 881 5
130	334		AUSHURFHEBEL	743 870 8
131	362		MIKRO-SCHALTER MSW-1275	749 104 6
132	364		WICKELTELLER	743 879 9
133	381		MIKROSCHALTER MSW 1290 CV	749 181 4
134	383		FEDER, RECHTS	743 871 6
135	366		FEDER, LINKS	743 872 4
136	394		ANDRUCKROLLE, RECHTS	743 877 3
137	395		ANDRUCKROLLE, LINKS	743 878 1
138	408		MOTORFULLY	749 105 3
139	410,411		BUERSTE FUER RIEMEN	742 371 8
140	412		MOTOR, SHU-2L	745 055 4
141	419,424		SICHERUNGSSCHEIBE 2 MM	987 250 8
142	425		SICHERUNGSSCHEIBE 1.5X3.1X0.5 MM	746 837 4
143	426,427		ERSETZT ET-NR. 947 800 9	
144	428		SICHERUNGSSCHEIBE 1,2X3X0,25 MM	986 045 3
145			SICHERUNGSSCHEIBE 3 MM	987 251 6
146			<u>ELEKTRISCHE TEILE :</u>	
147				
148			<u>MAIN-PCB-KUPL0307Z :</u>	
149				
150	D401-415		DIODE 1 N 4148	175 540 4
151	D501		BRUECKENGLEICHRICHTER PBPC 1003F	749 138 4
152	D502		BRUECKENGLEICHRICHTER PBM 152	749 139 2
153	D506-512		DIODE 1 N 4148	175 540 4
154	IC31,33,51		IC NJM 4555 D	950 628 8
155	IC32		IC LC 7821	745 498 6
156	IC41		IC UPC 1330 HA	748 612 9
157	IC42		IC BA 3416 BL	742 181 1
158	IC43		IC BA 3308	740 336 3
159	IC53		IC MC 7805 CK	954 476 8
160	IC54		IC MC 7812	945 820 9
161	IC55		IC LM 7912	956 924 5
162	JK05, SPEAK		LAUTSPRECHERBUCHSENLEISTE	734 920 2
163	L407		LOESCHOSZILLATORSPULE	749 146 7



ZEILE	POSITION	SYM BEZEICHNUNG	ET-NUMMER
164	Q401,402	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
165	Q403-407	TRANSISTOR KSR 1204 T	749 142 6
166	Q407,410	TRANSISTOR KSR 1206 T	749 143 4
167	Q408,409	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
168	Q411,417	TRANSISTOR KSR 1206 T	749 143 4
169	Q412,413	TRANSISTOR KSR 1204 T	749 142 6
170	Q414,415	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
171	Q416-419	TRANSISTOR KSR 1204 T	749 142 6
172	Q422,423	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
173	Q424-426	TRANSISTOR KSR 1204 T	749 142 6
174	Q427,428	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
175	Q429,434	TRANSISTOR KSR 1204 T	749 142 6
176	Q430,431	TRANSISTOR KSC 2361 Y	749 140 0
177	Q433,437	TRANSISTOR KSR 1206 T	749 143 4
178	Q434,435	TRANSISTOR KSR 1204 T	749 142 6
179	Q436,439	TRANSISTOR 2 SA 1175 F-SPEZIAL	969 577 6
180	Q438,440	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
181	Q441,442	TRANSISTOR KSD 1021 YT	749 141 8
182	Q443	TRANSISTOR KSR 2210 T	749 145 9
183	Q510,520	TRANSISTOR KSR 2206 T	749 144 2
184	Q511,512	TRANSISTOR KSD 1021 YT	749 141 8
185	Q513,514	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
186	Q519	TRANSISTOR KSR 1204 T	749 142 6
187	Q539	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
188	Q540	TRANSISTOR KSC 2361 Y	749 140 0
189	Q541	TRANSISTOR KSD 1021 YT	749 141 8
190			
191		<u>AMP-PCB-KUP10308ZB :</u>	
192			
193	D001-004	CAP.-DIODE 1 SV 110	749 147 5
194	D197	DIODE MA 27W	967 442 5
195	D505-507	DIODE 1 N 4003	176 413 3
196	D513 514	DIODE 1 N 4148	175 540 4
197	IC52	IC STK 4231 II	749 148 3
198	IC53	IC TA 7317 P	949 182 0
199	Q551,	TRANSISTOR 2 SC 945	175 739 2
200	Q552,554	TRANSISTOR 2 SC 945	175 739 2
201	Q553	TRANSISTOR 2 SA 733	723 075 8
202	R545,546	WIDERSTAND 0.27 OHM 5 WATT	747 041 0
203	RL51	RELAYS, LAUTSPRECHER	749 149 1
204			
205		<u>TUNER-PCB-KUP10317ZB :</u>	
206			
207		UKW-TEIL	749 151 7
208	D101,102	DIODE 1 N 4148	175 540 4
209	D106	CAP.-DIODE KV 1236 Z1	733 388 3
210	D109-129	DIODE 1 N 4148	175 540 4
211	D133	DIODE 1 N 4003	176 413 3
212	D135,138	DIODE 1 N 4148	175 540 4
213	IC11	IC ANAM 1013 M	749 150 9
214	IC12	IC AN 7273	985 557 8
215	IC13	IC TA 7343	986 333 3
216	LCD1	DISPLAY,RDF	749 152 5
217	PL13,14	LAMPE 16V/80MA	749 153 3
218	Q001	TRANSISTOR 2 SK 241 GR	998 355 8
219	Q002-004	TRANSISTOR 2 SC 1923 0	947 094 9
220	Q105	TRANSISTOR 2 SC 3195 (0)	989 832 1
221	Q111-118	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
222	Q119-120	TRANSISTOR 2 SA 1175 F-SPEZIAL	969 577 6
223	Q121	TRANSISTOR KSR 2206 T	749 144 2
224	Q122	TRANSISTOR KSR 1206 T	749 143 4
225	X101	QUARZ 4.5000 MHz	733 845 2
226			
227		<u>SUB-PCB-KUP10318Z :</u>	
228			
229	D210-214	LED SLV-31 VC3	746 863 0
230	D251-261	DIODE 1 N 4148	175 540 4
231	IC21,22	IC KA 2223	734 253 8
232	IC23,27	IC LB 1403	985 566 9
233	IC28	IC KS 74 HCT 14	749 155 8
234	IC29	IR-EMPFAENGER SBX 1483	749 156 6
235	JK03,MIC	KLINGENBUCHSE 6.3 MM STEREO	749 160 8
236	Q201	TRANSISTOR KSR 1204 T	749 142 6
237	Q202	TRANSISTOR KSR 2206 T	749 144 2
238	Q205,206	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
239	Q207,208	TRANSISTOR KSB 811 YT	749 154 1
240	Q210,211	TRANSISTOR 2 SC 2785 F-SPEZIAL	969 578 4
241	Q212,213	TRANSISTOR KSR 1204 T	749 142 6
242	Q214,215	TRANSISTOR KSR 2206 T	749 144 2

ZEILE	POSITION	SYM	BEZEICHNUNG	ET-NUMMER
243	SW21		SCHIEBESCHALTER	749 162 4
244	SW22		SCHIEBESCHALTER	749 163 2
245	SW23		DRUCKSCHALTER	749 161 6
246	SW201-227		TAKTSCHALTER	749 164 0
247	VR21-25, EQ		SCHIEBEREGLER 2X50KB	749 158 2
248	VR37, BAL		SCHIEBEREGLER, BALANCE	749 157 4
249	VR38, VOL		DREHPOTI 2X100KB MIT MOTOR	749 159 0
250				
251			<u>POWER-PCB-KUP10309Z :</u>	
252				
253	D701-705		DIODE 1 N 4003	176 413 3
254	JK04, KH		KLINKENSUCHSE 6.3 MM STEREO	749 167 3
255	RL71		RELAYS, STAND-BY	749 168 1
256	SW24		DRUCKSCHALTER	749 169 9
257	T701		NETZTRAFO STAND-BY	749 166 5
258	T702		NETZTRAFO, GROSS	749 165 7
259				
260			<u>CD-BEDIEN-PCB-511-009A :</u>	
261				
262	D903-908		DIODE 1 N 4148	175 540 4
263	D916		DISPLAY, CD	749 172 3
264	D917-922		LED SLR 34 VR3	744 869 9
265	Q916-920		TRANSISTOR 2 SA 733	723 075 8
266	SW902-914		TAKTSCHALTER	749 173 1
267				
268			<u>CD-MAIN-PCB-513-009A</u>	
269				
270	D901-910		DIODE 1 N 4148	175 540 4
271	D911-914		DIODE 1 N 4001	176 419 0
272	D915		ZENERDIODE ZFD 5,6	928 298 9
273	IC91		IC CXA 1081 S	745 665 0
274	IC92		IC CXA 1082 S	749 175 6
275	IC93		IC LB 1258	747 451 3
276	IC94		IC ANAM 101 C	749 176 4
277	IC95		IC CXD 1167	749 177 2
278	IC96		IC M 5294 P	749 178 0
279	IC97		IC KDA 0316LN	747 223 6
280	IC98, 99		IC NJM 4558 D	950 628 8
281	Q901		TRANSISTOR 2 SB 564 M	924 757 8
282	Q902, 904		TRANSISTOR KSA 539 Y	727 191 9
283	Q903, 905		TRANSISTOR 2 SC 945	175 739 2
284	Q906, 908		TRANSISTOR 2 SC 815	729 136 2
285	Q907, 909		TRANSISTOR KSA 539 Y	727 191 9
286	Q910, 912		TRANSISTOR 2 SC 815	729 136 2
287	Q911, 913		TRANSISTOR KSA 539 Y	727 191 9
288	Q914, 915		TRANSISTOR DTC 124 ES	997 768 7
289	Q921-924		TRANSISTOR 2 SC 945	175 739 2
290	Q925, 927		TR KSA733-Y	723 511 2
291	Q926		TRANSISTOR DTC 124 ES	997 768 7
292	Q928		TRANSISTOR 2 SC 945	175 739 2
293	Q929, 938		TR KSA733-Y	723 511 2
294	Q930, 931		TRANSISTOR KSC 1072 T	749 174 9
295	Q932, 933		TRANSISTOR 2 SC 815	729 136 2
296	Q934-937		TRANSISTOR 2 SC 945	175 739 2
297	X902		QUARZ 16.9344 MHZ	742 126 6
298				
299			<u>PLATTENSPIELER :</u>	
300				
301			MAGNET-SYSTEM C-55M	731 913 0
302			NADELTRAEGER DIAMANT N-50	731 914 8
303				
304			PLATTENSPIELER	749 214 3
305	3		RIEMEN	743 831 0
306	4		PLATTENTELLER	743 832 8
307	6		SICHERUNGSRING 6MM	743 833 6
308	25		KURVENRAD KPL.	743 834 4
309	26		MIKRO-SCHALTER	743 835 1
310	31		SCHALTHEBEL	743 836 9
311	32, ODER		MOTOR BFF 2R81T	740 815 6
312	32		MOTOR, SHR-2R	744 263 5
313	33		LIFTARM	743 837 7
314	35		LIFTHEBEL	743 838 5
315	38		SCHALTER, 33/45	743 839 3
316	40		KULISSE	743 840 1
317	44		STIFT FUER TONARM	743 841 9
318	45		TONARM	743 842 7
319	46		TONARMLAGER	743 843 5

ENDE

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.